ACTA CHIRURGICA SCANDINAVICA
SUPPLEMENTUM 165

DEFECATION BLOCK
in cases of
DEEP RECTOGENITAL POUCH

A surgical, roentgenological and embryological study with special reference to morphological conditions

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LENNART WALLDÉN

STOCKHOLM 1952

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LENNART WALLDÉN
MED. LIC., VÄRML.

AKADEMISK AVHANDLING

SOM MED TILLSTÅND AV MEDICINSKA FAKULTETEN
VID UPPSALA UNIVERSITET FÖR ERNÅENDE AV MEDICINE DOKTORSGRAD
OFFENTLIGEN FÖRSVARAS Å PATOLOGISKA INSTITUTIONEN
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ACTA CHIRURGICA SCANDINAVICA

SUPPLEMENTUM 165

FROM THE DEPARTMENT OF SURGERY, AKADEMISKA SJUKHUSET, UPPSALA, SWEDEN (HEAD: OLLE HULTÉN, M. D., PROFESSOR OF SURGERY, UNIVERSITY OF UPPSALA) AND THE DEPARTMENT OF HISTOLOGY (HEAD: MARTIN WRETE, M. D., PROFESSOR OF HISTOLOGY, UNIVERSITY OF UPPSALA)

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LENNART WALLDÉN

STOCKHOLM 1952

Translated by K. M. Lindskog

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Preface

The investigations which are presented in this publication were begun rather more than five years ago. It all sprang from a case of a peculiar defecation disorder in an old man who had up to then been examined repeatedly and treated without manifest results for what had been diagnosed as chronic constipation. The main feature of his defecation disorder was a feeling of intermittent block in the rectum when he was straining at stool. And rectal exploration did reveal a caudad bulge of the ventral wall of the rectum which was accentuated during straining and occluded the anal opening. The condition was interpreted as a precursor to true rectal prolapse caused by an abnormally deep rectovesical pouch which was filled with small bowel. This interpretation was supported by findings made at a specially planned roentgenological examination and was confirmed at a subsequent laparotomy. The deep rectovesical pouch was obliterated operatively by a procedure originally designed for prolapse of the rectum. This treatment permanently removed the defecation block which had been refractory to other treatment for many years. Examined soon afterwards and treated successsfully, a similar case in an old woman brought to mind the idea that there might exist a more general connection between the peculiar defecation disorder and the marked anatomical deviation. With this in view the author has collected a clinical material which, though small and incapable of unravelling all aspects of the question, does seem to justify the investigation and to serve as a basis for further discussions.

A study of the literature discloses that a number of disorders originating in abnormal depth of the rectovesical or rectouterine pouch have been observed and investigated with regard both to pathogenesis and to clinical manifestations. However, most of the relevant publications, the majority of which are in the form of case reports, are devoted to more or less manifest forms of hernia. Less attention seems to have been paid cases in which the deep pouch, though not passing through the pelvic floor yet extends deeply towards or into it and makes a bulge in

the rectal wall. Sporadically it is hinted that this anatomical deviation may give rise to defecation disorders. The latter relationship has constituted the central problem for the author's research.

*

As I now bring my investigation to a close it is a pleasure sincerely to thank those members of the Medical Faculty at Uppsala University who as my work has been going on have given competent advice and interested comment. I also wish to express my gratitude to all those colleagues, friends and assistants who have helped me in every way.

Through a preceding investigation my chief, Professor Olle Hultén, has introduced into Scandinavian surgery modern pathogenetic and therapeutical aspects on the true rectal prolapse. His interest in the separate but related disorder that is the main subject of this publication has, ever since the first case which he himself diagnosed and operated, taken the shape of stimulating suggestions, constructive criticism and never-failing encouragement. I wish to thank him most heartly for his untiring help.

To Professor Martin Wrete I direct my sincere thanks for his courtesy in letting me make use of a great part of his embryological material, for valuable aid in planning the embryological section of the work and for kind interest while it was being performed.

To Professor Hugo Laurell, my previous chief, I am greatly indebted for the profuse knowledge and for the fascinating scientific ideas which he so generously let me profit by during the years when I had the honour to be one of his assistants at the Department of Roentgenology. I thank him also for his interest in my work and for his kindness in letting me perform the roentgenological part of the investigation at his department although I no longer was employed there.

My deep gratitude is due to the present chief of the Department of Roentgenology, Professor Folke Knutsson, not only for permission to go ahead with the investigation commenced at his department, but also for his benevolent interest in my work and for giving me many pieces of good advice.

I offer my thanks to Professor Gunnar Dahlberg for the great interest he has shown in various problems posed by the investigation, particularly the mechanical aspects of it, and for planning and putting in hand the statistical computations.

I am under obligation to Professor David Holmdahl for his kindness in looking through the anatomical part of the text, Professors John

Naeslund and Erik Ask-Upmark for valuable discussions concerning the clinical parts of the investigation and Professor Ernst Bárány for critical evaluation of the mechanical points of view.

A great many colleagues have in the course of the years aided me in collecting the material and doing examinations. I owe particular thanks to Docents Hans-Gösta Skarby and Arne Frantzell for good help in roentgenological matters, Docent Josef Sääf for valuable advice on anatomical and terminological points and Doctor Per Arén, who did the special gynecological examinations.

For expert histotechnical work I thank Mrs. Gun Almquist, for painstaking statistical labours Miss Saga Neander, and for able assistance at the follow-up examinations Mrs. Kristina Andér.

I am especially grateful to the nursing and technical staff at the Department of Roentgenology for constant readiness to help me and for unyielding patience under working conditions that were often very pressing.

The colleagues, nurses and student nurses who gave of their time and comfort to make themselves available as test persons of the roentgenological control examination deserve and have my heartfelt thanks.

I lastly acknowledge my gratitude to the Medical Faculty of Uppsala University for aiding the investigation economically.

Lennart Walldén.

Terminology

The most caudal part of the peritoneal cavity goes under various names in English. The commonest terms are the rectovesical or rectouterine pouch, the pouch of Douglas and the cul-de-sac. The term rectogenital pouch is here used as an appellation common to both sexes. It was proposed as early as 1902 by Dixon & Birmingham and is also found in modern publications on normal anatomy (Uhlenhuth, Wolfe, Smith & Middleton, 1948). An analogous use is here made of the terms rectogenital fold, rectogenital septum, genitovesical pouch and sacrogenital ligament. So far as possible the remaining anatomical terms are those laid down by the Jena Convention (1935), although the anglicized form has usually been chosen.

CHAPTER I

Normal Anatomy

Data from the Literature

I. Anatomical Survey of the Pelvic Peritoneal Cavity, with Special Reference to the Rectogenital Pouch and its Relations to the Pelvic Floor and Rectum.

The following exposition is based on standard texts, chiefly CORNING's (1923) and BROMAN & ASK-UPMARK's (1941) textbooks of anatomy. Some details are taken directly from WALDEYER's (1899) and THOMPSON's (1899) classical monographs, others from more recent works by MILLIGAN & MORGAN (1934) and UHLENHUTH, WOLFE, SMITH & MIDDLETON (1948).

The Pelvic Cavity (Figs. 1—4) is the pelvic canal craniad to the pelvic floor. Being fixed to the floor of the pelvis where they pass through it, the pelvic organs proper project more or less freely into the pelvic cavity where, to a greater or lesser extent, they are invested by peritoneum. Via connective tissue which often has a high content of fat the latter is loosely fixed to the fascia, but at some places, e.g. over the uterus and dorsal side of the vagina and over the ventral side of the rectum, it adheres firmly. Moreover the pelvic peritoneal cavity contains parts of the abdominal viscera, mainly loops of small intestine and mobile parts of the colon.

In addition to bladder and rectum the pelvic viscera include internal genital organs: hence the appearance of the pelvic cavity differs considerably in men and in women. However, according to DIXON & BIRMINGHAM (1902), the pelvic cavity can be subdivided into three regions which, region for region, are equivalent in the two sexes: a ventral vesical, a dorsal rectal and, interposed between these, a genital region. These regions are characterized by the underlying viscera and demarcated by more or less prominent folds of peritoneum.

The Vesical Region and the middle region are demarcated by peritoneal folds over the ureters and, medially between these, by the dorsal margin of the bladder. When the bladder is empty this region appears as a depression dorsally of the symphysis. When the bladder is full it projects more or less into the abdominal cavity craniad to the symphysis.

The Genital Region refers to the uterus in women and to the ductus deferentes and glandulae vesiculosae in men. Broad peritoneal folds (plicae latae uteri) run laterally from the sides of the uterus to the pelvic walls. They enclose the cardinal ligaments of the cervix, blood vessels, nerves and oviducts. Between the uterus and bladder is formed a peritoneal depression, the genitovesical pouch, in man corresponding to a shallow de-

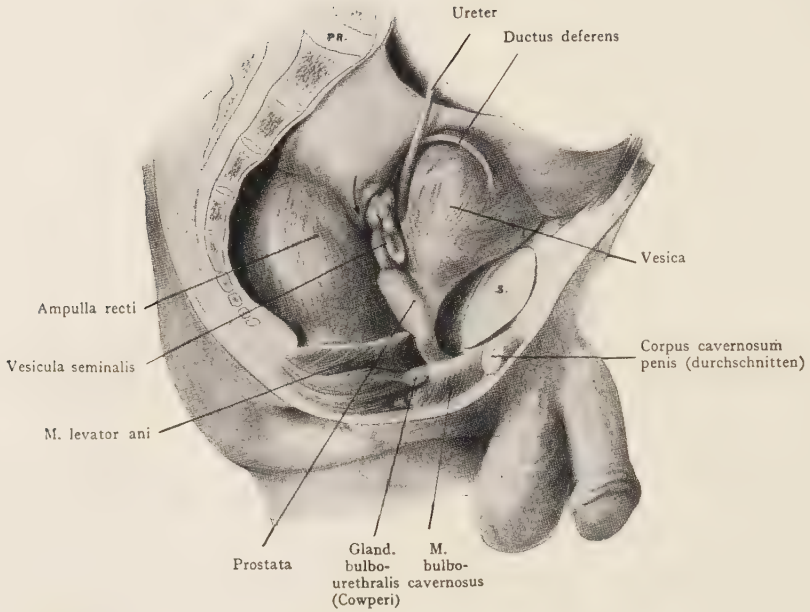

Fig. 1. Topographic relations of the male pelvic organs and the peritoneum, the caudalmost part of which is marked by an arrow (Corning, 1923).

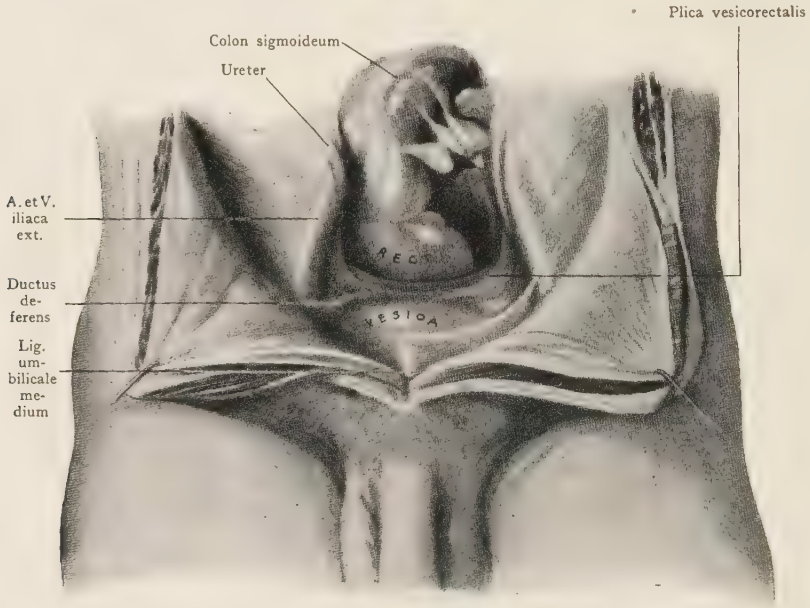

Fig. 2. Inlet to the male pelvic cavity (Corning, 1923).

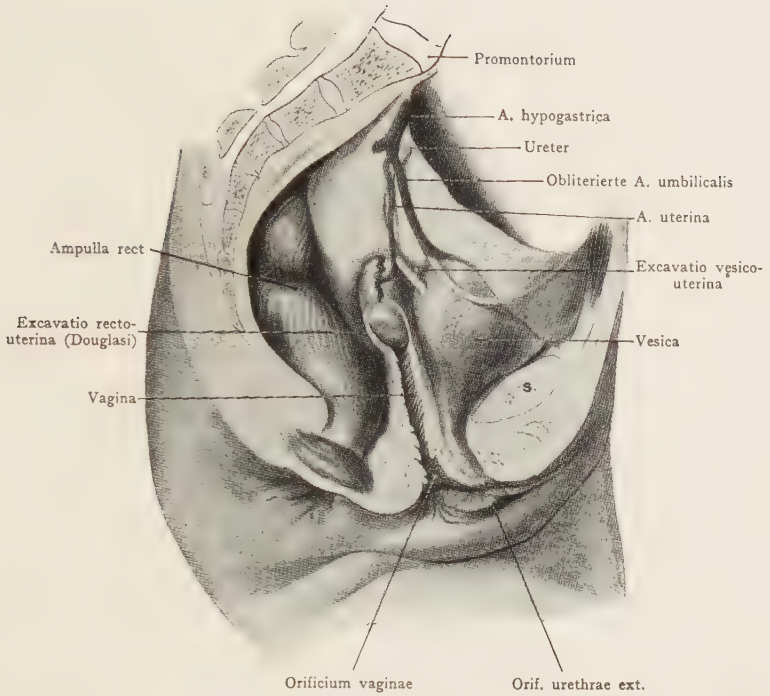

Fig. 3. Topographic relations of the female pelvic organs and the peritoneum (Corning, 1923).

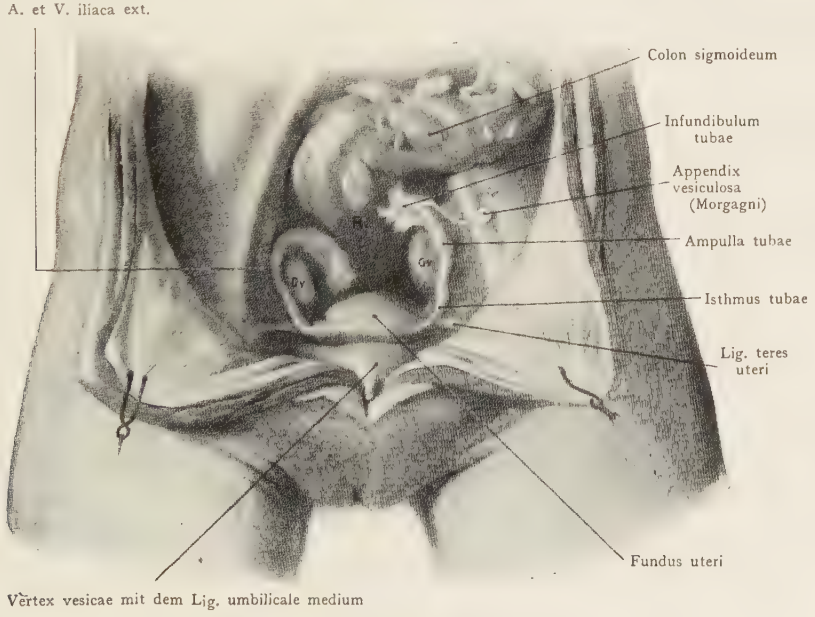

Fig. 4. Inlet to the female pelvic cavity (Corning, 1923).

pression which ventrally is demarcated by the bladder and dorsally by ductus deferentes. The uterus normally inclines slightly ventrad — more so when the bladder is empty, less when it is full. An extremely full bladder may even give the uterus a dorsad inclination, a condition known as retroversion of the uterus. The degree of dorsal turning is determined, among other things, by the ventral attachment of the uterine cornua via the uteroinguinal ligaments (chordae uteroinguinales) and by the restricted mobility due to the sacrogenital ligaments and those ligaments which ventrally attach the fascial ring round the uterine cervix to the symphysis. These correspond to the ventral ligamentous fixation of the prostate in men. In addition to being inclined the uterus is often bent, normally it is concave ventrally. A bend in the opposite direction is known as retroflexion of the uterus. The uterus may also be displaced in various directions in the pelvis. Dorsal displacement is known as retroposition of uterus. The limits are often diffuse between normal variations of uterine position, which are mainly dependent on the state of fulness of rectum and bladder, and pathological displacements, but extreme degrees are contingent upon changes in the supporting and fixing functions of the pelvic floor.

The Rectal Region is demarcated from the genital by the rectogenital folds which towards the peritoneal cavity mark the underlying sacrogenital ligaments. Running freely ventrad from the rectal sides, the folds join each other medially dorsad to the bladder in men and on the dorsal side of the uterine cervix in women. Between them lies the most caudal part of the peritoneal cavity, the rectogenital pouch.

The Rectogenital Pouch varies considerably with regard to configuration and volume. Apparently the borderlines between normal and pathological deviations are difficult to ascertain. Most data on the subject are based on findings made at autopsy, but some probably have doubtful validity when applied to conditions during life. Polk (1909) pointed out, for example, that the bottom of the peritoneal cavity and the levator ani muscle can lie closer together in corpses than in living subjects. Contributions to the anatomy of this part of the pelvis have also been obtained by roentgen examination of living subjects after administration of contrast media to the peritoneal cavity or to the organs of the true pelvis. These findings are surveyed briefly in the section on roentgenology.

According to standard textbooks of anatomy the cranial border of the rectogenital pouch is demarcated by the rectogenital folds. In certain cases, however, the latter may be missing altogether and in others they may be replaced by folds running from the promontory to the genitals (Waldeyer, 1899). Asymmetrical combinations of these folds have been described (Bertrand, 1927). It has been suggested that the rectogenital folds should instead designate the borderline between a cranial part — lying between the rectum and uterine body or the bladder (Waldeyer: "atrium excavationis rectouterinae;" Bertrand: "l'étage supérieur") —and a caudal part lying between rectum, uterine cervix and vagina or glandulae vesiculosae (Waldeyer: "fundus excavationis rectouterinae;" Bertrand: "l'étage inférieur").

The Cranial Part is confined sideways by the pelvic walls, has no sharp border cranially, and is largely filled with intestinal loops dependent from the abdominal cavity. In shape and volume this space is greatly influenced by the configuration of the bony pelvis, the size and position of the uterus, and the fulness of the rectum and bladder.

The Caudal Part as a rule presents as a narrow fissure between rectum and genitals. Normally it never (Zuckerkandl, 1891; Bertrand, 1927) or at least hardly ever (Kjellberg, 1942) gives entry to pendulous intestinal loops. According to Waldeyer (1899) the peritoneum in the adult male extends halfway down the glandulae vesiculosae and between them 1 cm farther caudad towards the prostate. In the adult female the caudal border is usually in level with the dorsal vaginal fornix, and it shows both craniad and caudad variations (Zuckerkandl, 1891). Uhlenhuth *et al.* (1948) put the caudal border relative to the bony pelvis in women immediately caudad to the coccygeal tip and in men at the level of the fourth or fifth sacral vertebra. The distance from the bottom of the rectogenital pouch to the anus is 5.5—10.5 cm in men and 6—7 cm in women.

The peritoneum is firmly adherent to the uterus and dorsal part of the vagina and to the ventral side of the rectum, but elsewhere it is separated from the underlying fascia by loose, fatty connective tissue. It usually has a smooth surface, except at the bottom of the pouch where it is pitted with depressions -a feature first described by Zuckerkandl (1891) who characterized it by the term lamina cribrosa. Uhlenhuth *et al.* (1948) have shown that the irregularity is attributable mainly to a rough, whitish line that resembles the scar after a surgical suture. Along and on either side of the line the peritoneum is often pleated, and sometimes the line is crossed by solid peritoneal cords as a sort of reinforcement (Fig. 5). This cicatricial line corresponds to the cranial insertion of the rectogenital septum which it follows laterally upwards to the pelvic walls where it forms the "lateral peritoneal wings" (Uhlenhuth *et al.*) that constitute a suspension organ on the intrapelvic fascia for the rectogenital pouch.

The Rectogenital Septum juts down as a fairly solid barrier between rectum and genitals. Laterally it merges with the intrapelvic fascia which as a continuous connective tissue system coats the floor musculature and walls of the pelvis and extends on to the pelvic viscera. The rectogenital septum has a caudal fixation in the pyramidal density of connection tissue and smooth muscles which, by the name of perineal body, lies between the anus and dorsal vaginal commissure or male urethra. At this structure

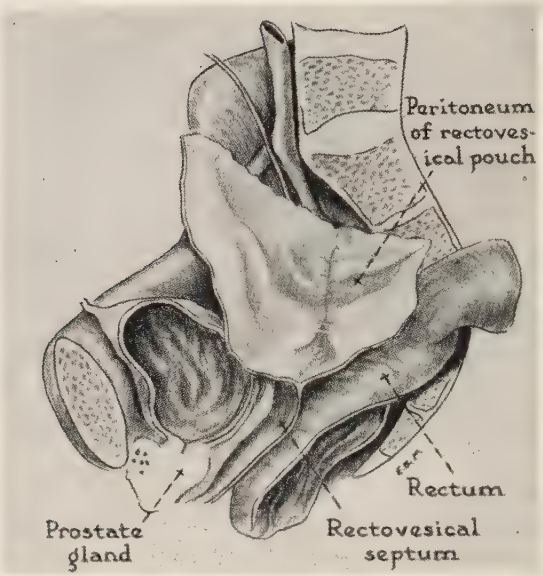

Fig. 5. Sagittal section through the pelvis showing the relations of the rectogenital septum and the peritoneum, with the scarlike line across the bottom of the rectogenital pouch bridged by the peritoneal cords (UHLENHUTH *et al.*, 1948. By Permission of *Surgery, Gynecology and Obstetrics*).

—which by virtue of its position next to the dorsal margin of the urogenital diaphragm is a central point of fixation for the muscles and fasciae of the pelvic floor—converge offshoots from the fascial sheaths of the pelvic organs. It is regarded as a keystone of the pelvic floor and has been called its Achilles tendon.

An important component of the floor of the pelvis is the levator ani muscle which is responsible for its funnel shape. The levator ani musculature is made up of several portions, of which pars pubica and especially its central part, pars puborectalis, are considered the most developed muscles of the pelvic floor. Arising beside the symphysis from arcus tendineus fasciae obturatoriae, pars puborectalis forms a firm U-shaped loop around the perineal flexure of the rectum. There it constitutes a significant part of the functionally and clinically important anorectal ring which furthermore comprises those portions of the internal and external anal sphincters which lie on the same level (Fig. 6).

Dorsally the levator ani muscle is complemented by musculus coccygicus and ligamentum sacrospinale. Ventrally it is reinforced by musculus transversus perinaei profundus which is situated caudad to it and which

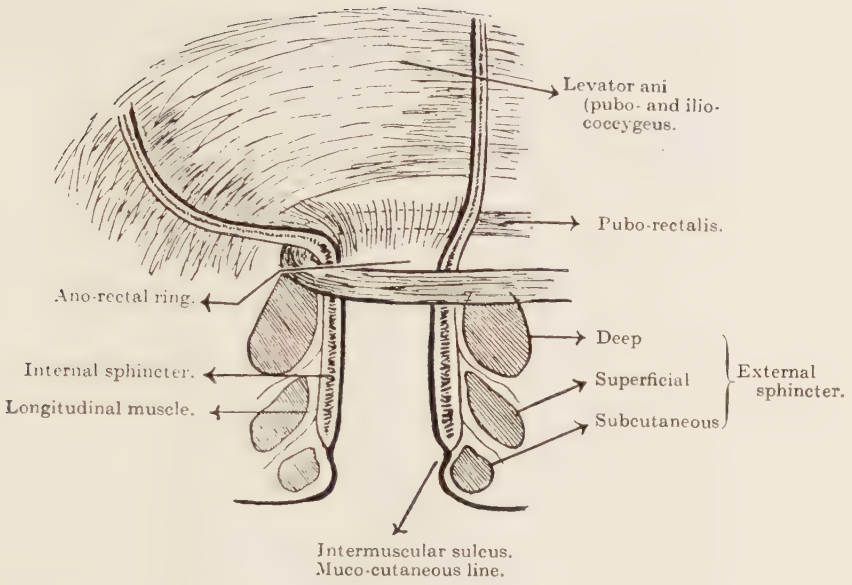

Fig. 6. Diagram of the anal musculature, showing the sling action of pars puborectalis (Lloyd-Davis, *Practitioner*, 1936: *136*: 186).

together with its aponeurotic fascial investment constitutes the greater part of the urogenital diaphragm.

Bundles of smooth muscles which by their arrangement largely coincide with more marked densities in the intrapelvic fascia lie imbedded in connective tissue between the pelvic floor muscles and the intrapelvic fascia as well as in the connective tissue surrounding the pelvic viscera. Their most important function is reportedly to render assistance in returning the fascia, which they exceed in tensibility, to normal dimensions after great distentions, such as during parturition.

The Rectum (Fig. 7), according to some textbooks of anatomy, extends craniad to the level of the third sacral vertebra, the spot where the colonic mesentery usually comes to an end. Both anatomically and clinically the caudal portion of the sigmoid flexure is closely associated with the rectum, and hence it is often termed the rectosigmoid. Usually having a well developed mesentery, this region is rather mobile in the pelvic cavity. Where it joins the rectum its lumen is constricted and there, according to some authorities, the wall is richer in circular muscle fibres. The functional significance of this sphincteral thickening of the wall is still in dispute. Following the sacral and coccygeal curvature caudad

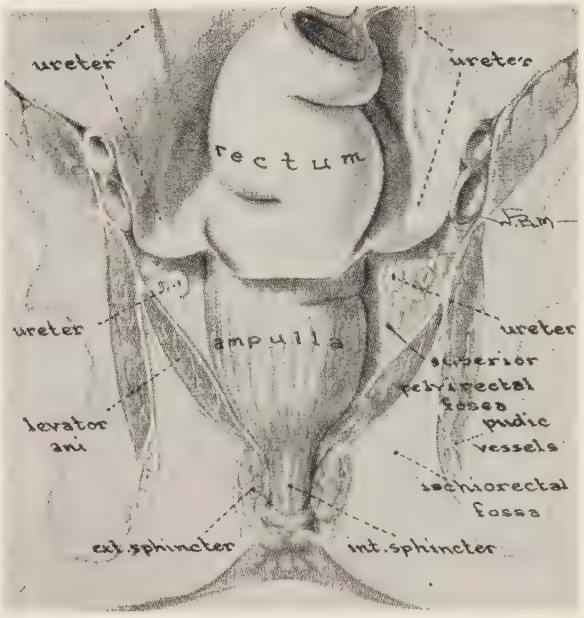

Fig. 7. Coronal section showing the rectum and its relations to the peritoneum and pelvic floor (BACON, Essentials of Proctology, J. B. Lippincott, Philadelphia, 1943).

and, finally, also ventrad, the rectum passes through the pelvic floor. There the anorectal ring marks the juncture with the anal canal which runs dorsocaudad for a length of about 3.5 cm. The rectal lumen runs a spiral course which is marked by three transverse infolds that are arranged to give the rectal contents a spiral traverse. That part of the rectum which is situated caudally of the middle and highest transverse fold is wider than the cranial part and is therefore often called the ampulla recti. Cranially the border of the rectal ampulla is more or less in level with the bottom of the rectogenital pouch. This means that its ventral wall is intimately connected with the rectogenital septum and so with the prostate or dorsal vaginal wall. Fatty connective tissue on its other sides allows the ampulla recti to vary in size in accordance with different degrees of fulness and contraction.

II. Some Roentgenological Features of the Rectogenital Pouch, the Floor of the Pelvis and the Bony Pelvis.

A central position in this field of study was formerly occupied by investigations designed to solve gynaecological problems. Not only has the introduction of contrast media

into uterus and oviducts rendered their cavities visible, but by entering the peritoneal cavity such media have blazed the way to a detailed roentgenological analysis of the latter. Increased attention was directed to this possibility after RUBIN (1920) had announced his introduction of gas as a contrast medium in hysterosalpingography. Even earlier (KELLING, 1902) a transabdominal method had been applied to the study of the intra-abdominal viscera. Later a number of authors recommended pneumoperitoneum combined with hysterosalpingography with an iodine-containing contrast medium (JUNG & SCHIRMER, 1926; STEIN & ARENS, 1930, etc.). However, after reviewing the literature, KJELLBERG (1942) pointed out that these methods entail great risks of gas embolism and warned against the use of gas as a contrast medium.

BERTRAND, VILLEMUR & BAILLAT (1926) studied the pelvic peritoneal cavity and pelvic organs by introducing the contrast medium directly into the cavity via the dorsal vaginal fornix instead of letting it pass the uterus and tubes. They used 20 ml of lipiodol. Their method was, however, not particularly successful. Taking up the method, MOLINENGO & CONTE (1933) employed a contrast medium consisting of 50 per cent abrodil. They considered the method of possible value for diagnosing morbid changes in the true pelvis but stressed the difficulty of interpreting films which were taken in a semisedentary position with a vertical beam.

A mighty impetus was given to the study of contrast roentgenography of the pelvic peritoneal cavity and of the organs projecting therein by KJELLBERG's (1942) paper on hysterosalpingopelvigraphy. His investigations were based on a series of 328 women in whom hysterosalpingography was done for various gynaecological indications, and in 18 cases of uterine cancer where pelvigraphy was performed with the contrast medium injected directly through the dorsal vaginal fornix. The contrast medium used was a 50 per cent solution of perabrodil in sterile water or procaine solution. The method involves roentgenography in dorsal, side, and semisedentary position with altogether eleven different projections of the pelvis. Sometimes, in order to observe better the bottom of the peritoneal cavity and any hernial protrusions therefrom, two supplementary exposures in upright position are made, with the injection instrument removed.

KJELLBERG found that the rectogenital pouch showed considerable postural changes in appearance. On side views it appeared broader and seemed to have a flatter bottom when the subject lay down than when the subject stood up. Its caudal margin was usually in level with the last sacral or the first coccygeal vertebra, but considerable variations occured. KJELLBERG published pictures of a case in which a rectogenital pouch with two narrow offshoots projected much deeper, far caudad to the last coccygeal vertebra. On frontal views in upright position the bottom of the peritoneal cavity as a rule had more or less irregular demarcations, sometimes undulating, sometimes flattened, sometimes drawn out

to a point. Bent more or less sharply, the bottom merged with the sidewall. Here and there in the lateral region of the bottom small recesses were seen, usually in the ventral portion of the pouch which was not infrequently asymmetrical. On side views in upright position the rectogenital pouch usually took the shape of a caudally narrowing sheath with a somewhat rounded tip. Not rarely, however, particularly in uterine anteflection, the caudal part was much broader and flattened. In such cases, but seldom in others, contours of contrast medium and gas due to small intestine were usually seen right down to the bottom of the pouch. Both the ventral and the dorsal margins of the pouch were more or less arcuate in the majority of cases. The bend in the dorsal wall of the pouch was due chiefly to the sacral curvature and to the degree of rectal filling, whereas the ventral wall conformed wholly to the uterine neck and vagina.

In a paper on roentgen examination of hernia Laurell (1929) demonstrated that in upright position with a dorsoventral beam the normal intestinal field in and medially of the inguinal regions usually does not reach caudad beyond approximately the cranial margin of pars acetabularis rami ossis pubis and slightly farther when the bladder is empty. In elderly lean subjects the small intestine could drop lower in the true pelvis, down to foramen obturatum. But such a position was considered fairly rare in young and middle-aged persons.

In a paper on roentgen diagnosis of space-restricting processes in the true pelvis (Walldén, 1944) the author has presented a method based on a framing of them by filling adjacent parts of the intestines with contrast medium. In addition the paper deals with the possibility of estimating the variable depth of the rectogenital pouch by filling with contrast the loops of intestine hanging down into it. The alteration of this depth after a regression of an inflammatory filling in the rectogenital pouch could be visualized by this method in certain cases.

By a modification of this method—the person being examined in upright position when the small bowel in the true pelvis has been filled with contrast—the caudad extent of the small intestine and its displacement by strain could be studied both in normal persons and in persons with an abnormally deep rectogenital pouch (Walldén, 1948).

The pelvic floor has formerly been the object of roentgenographic examination mainly in conjunction with micturition studies. Sgalitzer & Hryntschak (1921) found that voluntarily discontinued micturition gave rise to a ventrocraniad displacement of the whole bladder owing to simultaneous contraction of the pelvic floor musculature and sphincter

urethrae diaphragmaticae. Using urethrocystography, Edling (1945) observed the bladder and pars prostatica urethrae sinking dorsocaudad during micturition owing to relaxation of the pelvic floor. Introducing a lead ball into the rectum immediately craniad to the anal sphincter, so that the dorsal region of the pelvic floor could be kept under continuous fluoroscopic observation, he demonstrated that this part too of the pelvic floor sank about as far as the ventral. If the subject discontinued the urination, the bladder and urethra were seen to rise to their original level together with the lead ball.

The above study on the caudad extent and displacement of the small intestine in straining (Walldén, 1948) also included an investigation into the position and displacement of the pelvic floor under the same conditions. The method was based on contrast studies of the rectum and consequently warranted only indirect conclusions regarding the behaviour of the pelvic floor.

In roentgenological studies of the peritoneal pelvic cavity and the pelvic organs little attention has been paid to relations to the bony pelvis. Previously the pelvic skeleton, as such, has been studied chiefly from obstetrical viewpoints. But it has also been subjected to anthropological analysis. For the purposes at hand it is of interest to cite some data from a comparative study of male and female pelvises by Thoms & Greulich (1940). Their observations were based on a series of 200 student nurses and 69 male students. According to the relation between the median and transversal diameters of the pelvic inlet their pelvises were classified into three types called dolichopellic, mesatopellic and brachypellic. The percentage distribution of these types was approximately the same in the two sexes. The main differences concerned the widths of the incisura ischiadica and angulus pubis. The median diameter of the pelvic inlet on the whole showed equivalent values, with the following means in cm for the different types: Dolichopellic men 12.30, women 12.50; Mesatopellic men 11.46, women 11.75; Brachypellic men 10.77, women 11.06.

Disagreement has been prevalent about the choice of topographical points for pelvic mensuration, particularly with regard to the median diameter of the pelvic inlet. The majority of investigators have resorted to the classical conjugata vera between the promontory and the craniodorsal aspect of symphysis ossium pubis. But the position of the promontory varies considerably in different pelvic types and, moreover, it is not rarely difficult to distinguish roentgenographically. Caldwell & Moloy (1933) expressed the opinion that the promontory "is too unstable in position to the plane of the inlet to be used as the point of origin" for

the median diameter. They suggested that instead that point on the ventral side of the sacrum should be used at which the dorsad extensions of the lineae arcuatae seem to converge on side views. As a rule this point lies about at the middle of the first sacral vertebra, but it may lie as low as the juncture between the first and second vertebrae. With such a point of origin the median diameter would on the whole lie in the same plane as the transversal diameter of the inlet. The median diameter proposed by Caldwell & Moloy is the one adopted in the above mentioned publication by Thoms & Greulich.

Summary and Aims

In this survey emphasis has been laid on the configuration and depth of the rectogenital pouch and on its relations to the organs, floor, and skeleton of the pelvis. The function of the rectogenital septum as a supporting and attaching structure between the ampulla recti and the genital organs has been pointed out, as has the role of the perineal body as a central point of fixation in the pelvic floor. Data from various roentgenological studies have been given concerning the variations in the attitude of the pelvic floor during micturition and straining. Finally some information is given about roentgenological mensuration of the pelvis.

Particular interest for the purposes of this work attaches to the relations of the ventral wall of the rectum to the prostate or uterus in straining, as ascertained by rectal palpation. As the literature contains little of value with regard to the subject, a special investigation was carried out.

A correct evaluation of the operative findings in the pathological cases requires knowledge of the normal anatomy of the pelvic peritoneal cavity, such as it appears at laparotomy. These matters should be studied under operative conditions that as far as possible conform to those that apply in the pathological cases.

As a background for the roentgenological study of the pathological cases a description is required of the corresponding findings in a control series of healthy persons. Such an investigation should deal with the rectum and pelvic floor as well as with the peritoneal pelvic cavity with its viscera, special attention being paid to the mutual relations of these structures and to their displacements in straining.

The Author's Observations

I. Rectum and Pelvic Floor

A. Palpation Findings

The effect of straining on the relations between the ventral wall of the rectum and the prostate or vaginal portion was studied in a control series (Table 1) of patients without defecation disorders and with diseases that were usually extra-abdominal and never had any bearings on the problem at hand. In no case did exploratory rectal palpation of the supine patient disclose any abnormalities with regard to the ampulla recti, anal canal, pelvic floor, uterus, or prostate (Fig. 8).

Obviously such an examination is not free from drawbacks. The thickness of subcutaneous fat and the mobility of the pelvic floor are both subject to individual variations that might give rise to errors in the digital localization of the anus and the estimation—by measuring on the palpating finger—of its distance from various intrarectal points. These factors were taken into the fullest possible account, but it should be noted that the figures given in Table 2 are approximate and are of value chiefly for comparison with the pathological findings.

TABLE 1.

Distribution of Rectally explored Controls.

Age group	Men	Women	Total
20—39 years	11	12	23
40—59 years	9	8	17

TABLE 2.

Palpatory Findings in Controls.

	Filling of ampulla recti 0 = Nil, + = Slight, + + = Moderate, + + + = Marked				Distance between anus and vaginal portion or base of prostate			Caudad displacement of vaginal portion by strain			Caudad protrusion of ventral rectal wall, from vaginal portion or base of prostate, by strain		
	0	+	+ +	+ + +	7 cm	8 cm	9 cm	0 cm	1 cm	2 cm	0 cm	1 cm	2 cm
Men	10	6	4	—	4	12	4	—	—	—	18	2	—
Women .	12	5	3	—	7	11	2	13	6	1	16	4	—

Fig. 8. Diagram showing the relations of the ventral rectal wall and the prostate or uterus, and of the rectogenital pouch, as they appear at digital exploration of the rectum.

The study of these patients thus disclosed little or no descent of the ventral rectal wall relative to prostate or vaginal portion, and no significant dislocation of the latter.

B. **Roentgenological Findings**

1. *Materials*

Most of the roentgenological control material was made available by medical students and student nurses, some by doctors and nurses and a little by a few patients with diseases unconnected with the author's research problem. None of these persons had defecation disorders; all the women were nulliparous.

Table 3 shows the distribution of the total material. A general orientation with regard to the anatomical variation was obtained from the set of the films. But some films were

TABLE 3.

Distribution of Radiological Controls.

Age Group, Years	Men	Women	Total
0— 9	7	2	9
10—19	—	4	4
20—29	33	37	70
30—39	8	4	12
40—49	4	2	6
50—59	1	2	3
Total	53	51	104

later sorted out since technical imperfections made it impossible to identify the points of orientation exactly enough for reliable measuring. The reduced material is accounted for in Table 5.

2. *Methods*

Examination Technique. Having emptied the bladder, the test person was put on a trochoscopy table and given barium enema for ordinary colonic examination. When contrast had reached the descending colon the enema was stopped. Before an ordinary fluoroscopic screen frontal exposure of the pelvis was made with the "central ray" by fluoroscopy directed approximately at the symphysis, the test person standing at ease with pendulous arms, straight hip and knee joints and naked heels against an edge at right angles to the ray. Then the pelvis was exposed in lateral projection (Fig. 9: I) with the central ray by fluoroscopy directed about midway between the dorsal and ventral aspects of the trunk in level with the symphysis, the test person standing with arms crossed over the chest, hip and knee joints straightened and heels against an edge parallel with the ray. The test person having evacuated the contrast, two more exposures were made in upright position, one in frontal and one in lateral projection (Fig. 9: II), as above, and another in lateral projection (Fig. 9: III) with the person straining as much as possible, in order to observe the effect of abdominal press on the position of the pelvic floor.

In some of the test persons the effect of isolated contraction of the pelvic floor was studied on special frontal and lateral exposures made in pronounced voluntary contraction of the pelvic floor musculature.

Mensuration Technique. A standardized technique was adopted in order to make possible a numerical characterization of the material whereby fundamental relationships between the bony pelvis, rectum, and pelvic floor, as well as any differences between material groups, might be found. Only the side views were measured, for, in respect of certain points, they very nearly represented the median plane. The test persons varied in width, so the distances between focus, object and film were not constant. Consequently the method warranted no conclusions regarding absolute distances, but it did permit computation of relative measurements, and for the problem at hand that was of greater interest. Comparable values were obtained by converting proportionately the distances measured on the films to a value of 10 for the median diameter of the pelvic inlet. The latter was determined according to Caldwell & Moloy (1933, p. 19).

All the lines and points used in taking the measurements are set out on the scetches in Fig. 9.

The median diameter of the pelvic outlet was measured from the tip of the coccyx to the caudal rim of the symphysis. The dorsal endpoints of the inlet and outlet median diameters were joined by a line, here called the sacrum-coccyx axis. From a perpendicular arising at the cranial end of the sacrum-coccyx axis a line was drawn parallelling the latter to the caudal termination point of rectal contrast. If the coccyx is moved by straining, the sacrum-coccyx axis will have a variable course. The same applies with equal force to the parallel of the axis to the caudal termination of the rectal contrast.

Statistical Data. The standard deviation (σ) was calculated according to the formula:

$$\sigma = \pm \sqrt{\frac{\Sigma a^2}{n-1}}$$

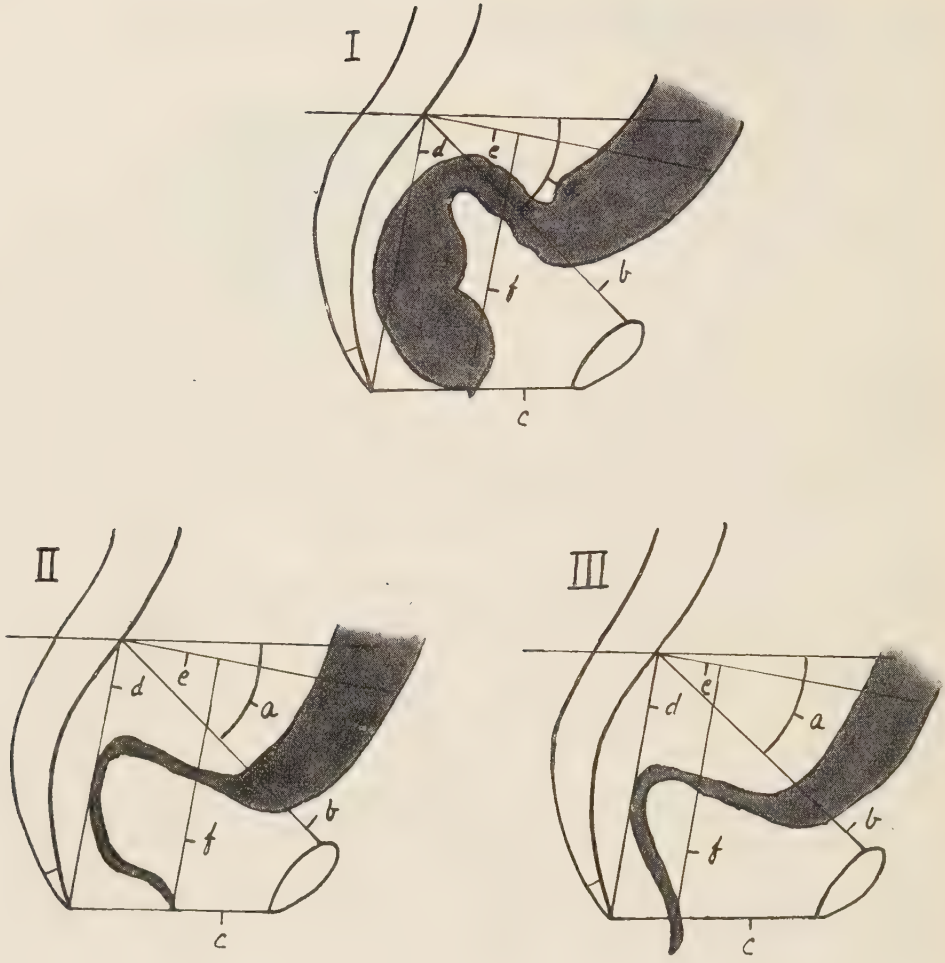

Fig. 9. Diagrams showing measurements taken on the lateral views:

I. Lateral view of the pelvis with the rectum filled with contrast.

II. Lateral view of the pelvis with a little contrast remaining in the emptied rectum.

III. Lateral view of the pelvis with a little contrast remaining in the emptied rectum, exposed during straining.

a. Angle of pelvic inclination; b. Median diameter of pelvic inlet; c. Median diameter of pelvic outlet; d. Sacrum-coccyx axis: distance between dorsal endpoints of b and c; e. Perpendicular to cranial endpoint of sacrum-coccyx axis; f. Craniocaudal level of anorectal ring, as measured at right angles to the perpendicular to d.

Where a designates the deviation from the mean and n the number of observations. When n exceeded 50, the standard deviation was calculated simply by using n instead of $n-1$.

The standard error of the mean, ε (M), was calculated from the formula:

$$\varepsilon\,(M) = \pm \frac{\sigma}{\sqrt{n}}$$

The standard error of a difference, ε (D), was calculated from the formula:

$$\varepsilon\,(D) = \pm \sqrt{\varepsilon^2(M_1) + \varepsilon^2(M_2)}$$

where ε (M_1) and ε (M_2) indicate the standard errors of the two subtracted series.

A difference exceeding $3 \times \varepsilon$ (D) is considered significant and one exceeding $2.5 \times \varepsilon$ (D) very probable, according to DAHLBERG (1940).

The standard error of a single determination (σi) was calculated by the following formula (DAHLBERG, 1940):

$$\sigma_i = \pm \sqrt{\frac{\Sigma d^2}{2n}}$$

where d indicates the difference between double determinations and n the number of differences. This standard error is given in per cent of the corresponding mean.

Error of Observation. The reliability of the roentgenological method depends not only on the sharpness of the photographic image, but also on accuracy in placing object and film, directing the beam, and measuring on the film. Asymmetrical distortion of the object also has an effect. In order to estimate the significance of these factors a small number of double determinations were made. They included: 1. double measurements on the same film, 2. measurements of the same person on two films exposed at a few minutes' interval,

TABLE 4.

Standard Error of a Single Determination, Calculated from the Difference Between Two Measurements in the Same Case.

	Same film		Two films from same person		One film from each side of same person	
	No. of cases	σ_i in % of M	No. of cases	σ_i in % of M	No. of cases	σ_i in % of M
Angle of inclination	26	1.14	24	3.64	36	2.81
Median diameter of pelvic outlet	26	1.56	24	2.32	36	3.42
Length of sacrum-coccyx axis	26	0.97	24	2.06	36	2.76
Craniocaudal position of anorectal ring	26	1.21	24	2.18	36	3.56
Craniocaudal position of anorectal ring in straining	23	1.25	—	—	—	—

3. measurements on two films of the same person, one with the casette on the left side, the other with the casette on the right side. The data obtained are accounted for in Table 4, which gives an idea of the accuracy of the estimations. It should be noticed, however, that this source of error is part of the total variability which will be discussed later and therefore is of minor importance here.

3. *Shape and Position of the Rectum*

The dorsoventral exposure of the contrast-filled rectum varies quite a lot, in first place owing to the circumstances of projection. This variability derives from variations in rectal curvature in the sagittal plane and from differences in the configuration and inclination of the bony pelvis. An almost vertical rectum in a pelvis with a small angle of inclination and a comparatively straight sacrum may produce an almost ideal frontal view, whereas the opposite extreme gives rise to an extremely deformed picture of the rectum.

But also in cases when image deformity due to unfavourable projection conditions can be disregarded the rectal shadow on a frontal film presents a variable contour. The degree of rectal fulness must obviously bear part of the blame. Usually, however, a more or less clear inpression is obtained of the size of ampulla recti, the inflections of the transversal folds and of the caudal termination which is rendered conical by the position of the levator. The shape is also brought about by the state of contraction of the pelvic floor musculature. When these muscles are relaxed, the conicity is less pronounced while marked contraction of the levator makes the contrast-filled end more attenuated.

The contrast-filled rectum in side projection partly shows the degree of curvature of the rectum in the sagittal plane, partly the variability in craniocaudad or dorsoventrad position of the caudal contrast termination. The latter represents the point at which the rectum becomes the anal canal, the borderline being marked by the anorectal ring of which pars puborectalis of the levator ani muscle is a part. The dorsal margin of the contrast termination often has a more or less marked impression that is probably caused by the muscular loop just mentioned. The caudal contrast termination changes shape and position on side views, too, as the contraction of the pelvic floor musculature varies. When the musculature is relaxed, it lies more caudad and dorsad and is rounded. Levator contraction moves it more cranioventrad and simultaneously it becomes narrower and the dorsal impression gets more marked (Fig. 11). This impression is often quite pronounced, probably because the compressing

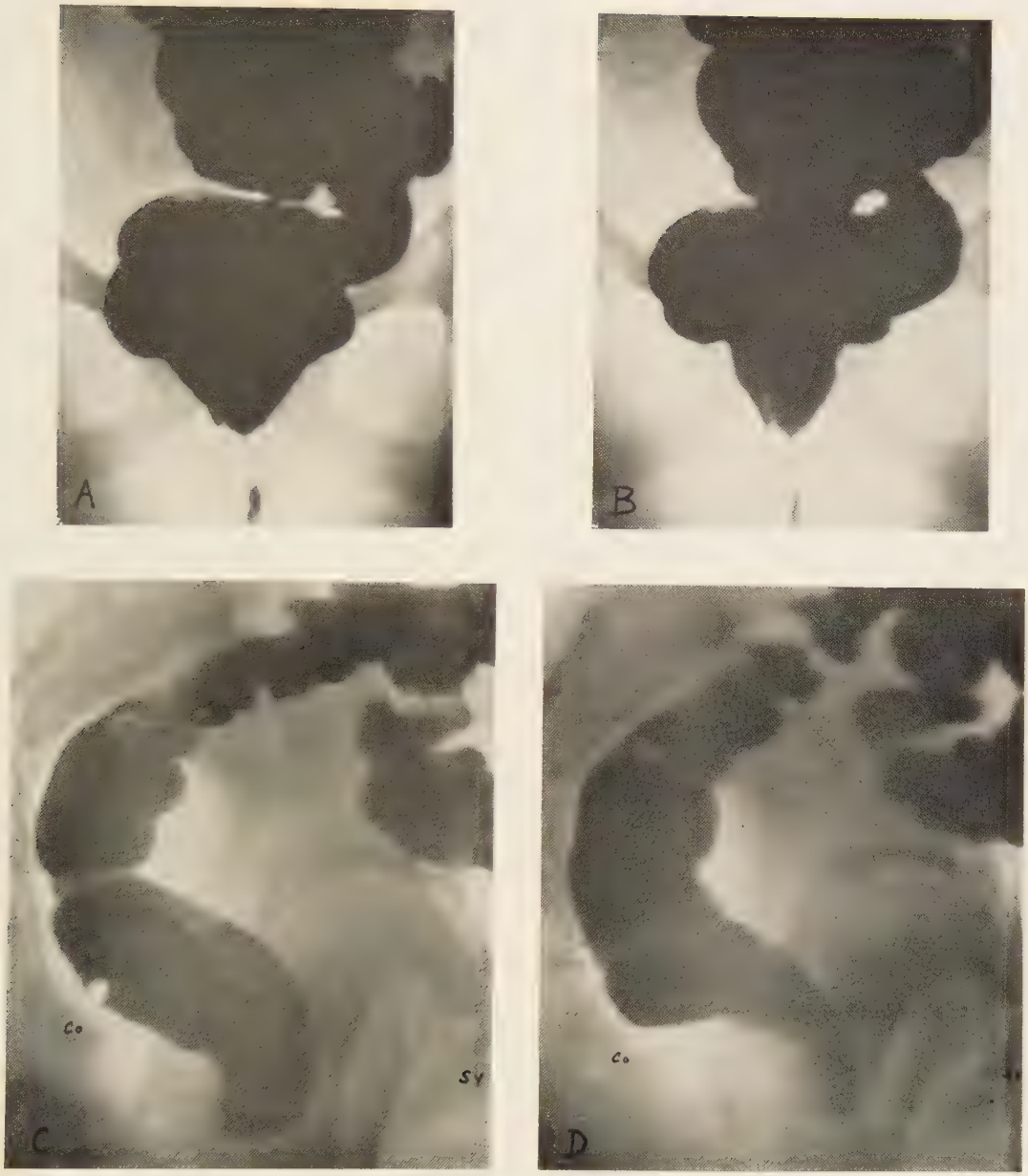

Fig. 11. Frontal and side views of the rectum filled with contrast, showing the varying shape and position of the caudal contrast contour at different degrees of pelvic floor contraction. A and C: without voluntary contraction; B and D: with voluntary contraction.

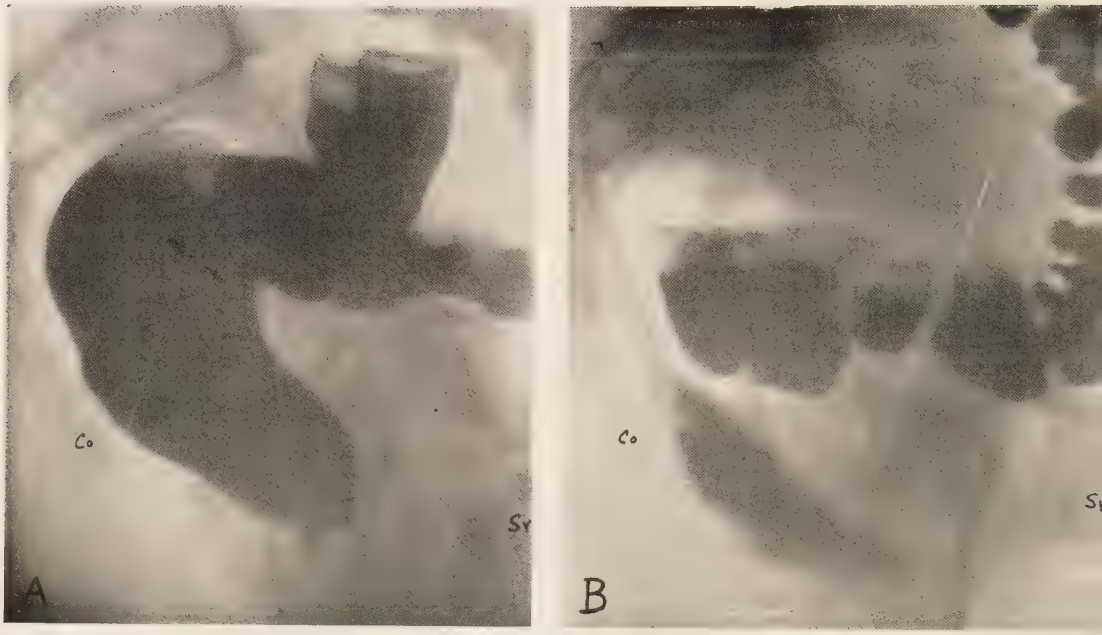

Fig. 12. Lateral views of the rectum: A. Filled with contrast to localize the anorectal ring at rest; B. A strain with most of the contrast ejected, to localize the anorectal ring in abdominal press.

Fig. 13. Side view of a 24-year-old woman's rectum with most of the contrast voided. Contrast in the sigmoid, which lies above the uterus, outlines the latter's dorsoventral position in the pelvis.

and displacing effect of pars puborectalis is enhanced by contractions in other sections of the levator.

The shape of the rectum and the position of the anorectal ring is also affected by increasing age. The anorectal ring in the child is situated comparatively far ventrocraniad, making the part of the pelvic floor dorsad to it proportionately bigger than in adults. In the growing period the anorectal ring undergoes a dorsocaudad displacement, in the adult bringing it approximately to the middle of the median diameter of the pelvic outlet. Advancing age can apparently be accompanied by farther dorsocaudad movement.

There is moreover a difference between the sexes. About 50 per cent of male recti run caudally of the pelvic outlet, while the corresponding figure for women is about 80 per cent.

Some of the films taken after contrast evacuation permit an estimation of the dorsoventral localization of the uterus (Fig. 13).

4. *Position of the Pelvic Floor and its Displacement in Straining.*

The adopted method provides no direct information regarding the position of the pelvic floor. It is instead based on the localization of the anorectal ring which by virtue of its central position in the pelvic floor can be regarded as an indicator of the latter's position.

Straining includes a contraction of the striated musculature of the pelvic floor. Whereas an isolated contraction of these muscles is manifested by a more or less pronounced cranioventrad displacement of the anorectal ring, the position in straining is fixed by the counterbalanced forces of the intraabdominal pressure, on the one hand, and the resistance of the contracted pelvic floor, on the other.

These functions cannot be studied when the rectum is full. The injected barium enema was therefore evacuated, apart from an negligible quantity remaining as a lining film on the walls. Frontal views are useless for these studies. It was sometimes difficult to find the anorectal ring on side views owing to filling defects in the contrast. The values for the statistical analysis of the position of the anorectal ring at rest were therefore obtained from films with a full rectum (Fig. 12a). Straining might possibly displace the small amounts of contrast inside the gut, but the closed anorectal ring prevents passage to the anal canal (Fig. 12b).

Average figures for the position of the anorectal ring relative to the bony pelvis and for its displacement caudad by strain in the two sexes are given in Table 5.

TABLE 5.[1]

	Men			Women			Difference men—women
	No.	M ± ε (M)	σ	No.	M ± ε (M)	σ	
Angle of pelvic inclination ..	51	55.57 ± 0.82	5.83	50	53.06 ± 0.89	6.26	2.51 ± 1.21
Median diameter of pelvic outlet	51	8.04 ± 0.17	1.23	50	7.87 ± 0.11	0.81	0.17 ± 0.20
Length of sacrum-coccyx axis	51	10.38 ± 0.12	0.88	50	9.12 ± 0.09	0.64	1.26 ± 0.15
Craniocaudal position of anorectal ring	51	9.79 ± 0.13	0.95	50	9.06 ± 0.08	0.60	0.73 ± 0.15
Craniocaudal position of anorectal ring in straining ...	47	10.78 ± 0.18	1.24	47	9.98 ± 0.14	0.96	0.80 ± 0.23

It will be seen in Table 5 that the median diameter of the pelvic outlet is about the same in the two sexes after standardization of the corresponding inlet diameter. On the other hand, similarly computed the length of the sacrum-coccyx axis is longer in men than in women, the difference being statistically significant. There is also a statistically significant difference between the sexes with regard to the craniocaudal position of the anorectal ring, but the difference is not as great as the preceding one. The result is that the anorectal ring in men is situated somewhat more cranial relative to the tip of the coccyx than in women. The position of the anorectal ring during straining suggests that the relative caudad displacement of the pelvic floor is on the whole the same in men and in women.

II. The Pelvic Peritoneal Cavity and its Contents

A. Laparotomy Findings

In a series of 20 men and 20 women without defecation disorders (Table 6), who were operated upon for diseases of the stomach and biliary tract,

TABLE 6.

Distribution of Surgical Controls.

Age group	Men	Women	Total
20—39 years	9	10	19
40—59 years	11	10	21

[1] The means and standard errors given are not absolute values but proportionals obtained by reduction to a standardized value of 10 for the median diameter of the pelvic inlet (cf. p. 23).

TABLE 7.

Palpatory Findings in Surgical Controls.

	Contents of caudal part of rectogenital pouch				Dorsoventral width of caudal part of rectogenital pouch			Position of bottom cranially (+) or caudally (−) of vaginal portion and base of prostate				
	Empty	Small bowel	Sigmoid	Small bowel & sigmoid	Narrow	Medium	Wide	+2 cm	+1 cm	0 cm	−1 cm	−2 cm
Men	12	4	2	2	9	6	5	2	4	10	4	—
Women .	14	3	3	—	11	6	3	2	5	7	1	—

the pelvic peritoneal cavity was explored by palpation from the laparotomy incision. In so doing the factors of interest were the contents of and caudad extent of the rectogenital pouch, the position of its bottom relative to the prostate or uterus and whether the tip of the coccyx or anal sphincter could be felt from the bottom of the pouch. All patients were operated on under spinal anasthesia and in horizontal supine position.

At palpation the exploring hand with palm turned towards the patient's ventral side first appraised the contents of the rectogenital pouch, then measured the dorsoventral distance in the caudal part of the pouch between the rectum and prostate or uterus and vagina and finally determined the position of the bottom of the pouch relative to the latter organs. A width of less than one finger was considered narrow, a passage wider than one but narrower than two fingers modarately wide and a passage permitting entry of two or more fingers was considered wide. The degree of rectal fulness obviously might affect estimations of the dorsoventral width of the pouch. On the evening before the examination the patients were given an enema, and at operation the rectum should have been empty or only slightly filled. Furthermore, the spinal anesthesia gave rise to sigmoidal and rectal contraction, so the organs concerned probably took up less space than under physiological conditions.

The observations accounted for in Table 7 were in most cases checked by another surgeon on the operation team. Nevertheless the method is rough and subjective. The findings were therefore considered with circumspection, and their chief value consists in forming a background to observations in the pathological cases.

The tip of the coccyx and the anal sphincter were not palpable from the bottom of the rectogenital pouch in any of the examined cases.

The investigations revealed that the caudal part of the rectogenital pouch was empty in more than half of the cases and constituted a narrow slit-shaped space in almost as many cases. The floor of the pouch usually lay just craniad to or in level with the base of the prostate or the vaginal portion; it extended as far as one cm caudad to these reference points in only 5 cases.

B. Roentgenological Findings

1. *Materials*

The same material was used as for the study of rectum and pelvic floor (Table 3, p. 22). Here, too, technical imperfections made it necessary to discard some films. The ultimate material is accounted for in Table 9.

2. *Methods*

Examination Technique. The rectogenital pouch can of course be visualized by pelvigraphy with a water-soluble contrast medium deposited in the peritoneal cavity. But the contrast must either be introduced through uterus and tubes in women (perhaps through a puncture in the dorsal vaginal fornix) or, in both sexes, through a puncture in the abdominal wall. In both cases, at least when it is a matter of collecting experimental data from healthy persons, the procedure suffers from serious drawbacks. However, such procedures were possible in some of the abnormal cases, and these will be discussed in their proper place. But a method suitable for the author's purposes need only supply data as to the contents of the rectogenital pouch and its relations to neighbouring organs —chiefly the rectum and anal canal, the pelvic floor and the bony pelvis—as to the depth of small bowel in the true pelvis and as to any displacements brought on by straining.

When the contrast after the preceding rectal examination was thought to have escaped in its entirety, usually within a week, a barium meal was administered by mouth, as for an ordinary examination of the stomach, in two rounds of about two ordinary glassfuls each at an interval of two hours. An hour after the last lot of contrast and with an empty bladder one frontal and two side views were made (Fig. 14: IV & V) by the same technique as for the examination of the rectum and pelvic floor, i.e. the last film with the test person applying maximal strain.

As for the rectum, the effect of isolated contraction of the pelvic floor was studied in a small number of persons.

Measuring Technique. The lines and points outlined in Fig. 14 were used in taking the measurements.

For the skeletal measurements the same factors applied as for the rectal films (p. 23). The depth of the small bowel in the true pelvis was measured along a line at right angle to the perpendicular from the cranial end of the sacrum-coccyx axis to the midpoint of the median diameter of the pelvic outlet. Dividing the median plane of the pelvis into a dorsal and a ventral section, this line will shift position if the coccyx is mobile and becomes displaced by straining. As the caudal margin of the small intestine also can change shape and position owing to straining, the dorsoventral division is rather schematic.

Statistical Data. The statistical computations were carried out with the aid of the formulae given on page 23 and 25.

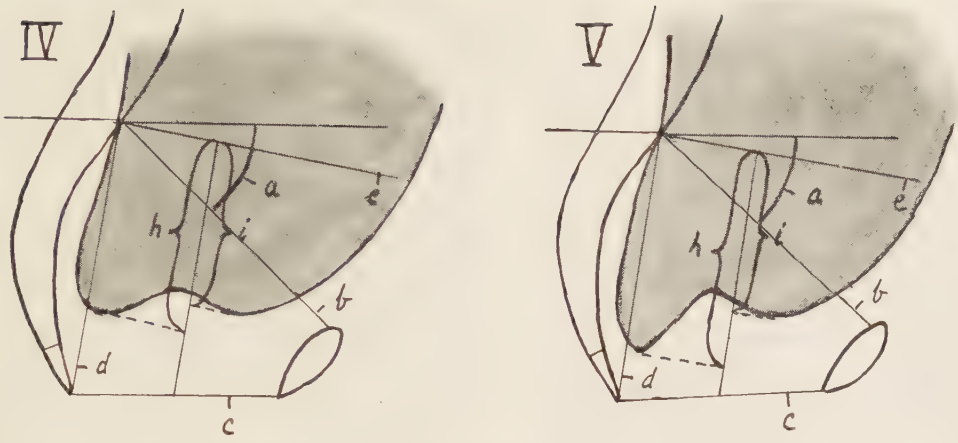

Fig. 14. Diagrams showing measurements taken on the lateral views:

IV. Lateral view of the pelvis with contrast in the small bowel, without strain.

V. Lateral view of the pelvis with contrast in the small bowel, with strain.

a. Angle of pelvic inclination; b. Median diameter of pelvic inlet; c. Median diameter of pelvic outlet; d. Sacrum-coccyx axis; e. Perpendicular to sacrum-coccyx axis; h. Depth of small bowel in true pelvis, dorsally of a line at right angles to the perpendicular from the cranial end-point of the sacrum-coccyx axis to the midpoint of the median pelvic outlet diameter; i. Depth of small bowel in true pelvis, ventrally of the above line.

Error of Observation. The accuracy of the roentgenological method was tested in the manner specified on p. 25. The results obtained will be found in table 8.

Unlike the selected skeletal points and the anorectal ring, which are on the whole located in the median plane, the caudal small bowel margin is caused by a mass of contrast that is not confined to the median plane. The depth and caudad displacement by strain of the small intestine are consequently liable to be somewhat overdimensioned. The

TABLE 8.

Standard Error of a Single Determination, Calculated from the Difference Between Two Measurements in the Same Case.

Extent of small bowel in true pelvis	Same film		Two films from same person		One film from each side of same person	
	No. of cases	σ_i in % of M	No. of cases	σ_i in % of M	No. of cases	σ_i in % of M
Dorsally	26	1.03	26	1.99	36	5.96
Dorsally during straining	24	0.69	—	—	—	—
Ventrally	26	1.32	26	3.08	36	5.01
Ventrally during straining	24	1.74	—	—	—	—

importance of this source of error is difficult to estimate, but at least in the controls a greater depth and a greater caudad displacement due to straining is connected with a narrowing from the sides of the contrast accumulation, which would cause the caudal margin to coincide more nearly with the median plane.

3. *Extent of Small Bowel in the True Pelvis*

Evidently the shape and extent of the peritoneal cavity in the true pelvis is in part determined by the fulness of the bladder, rectum and sigmoid, and in women by the position and size of the uterus. The same applies to the distribution of the small intestine in the pelvic peritoneal cavity. The adopted roentgenological method is designed with this in view, whereas it warrants only indirect appraisal of the extent of the peritoneal cavity itself.

Immediately before the examination the bladder was emptied, while nothing was done about any fecal masses that might be contained in the colon. Yet the extent of the contrast-filled small bowel in the true pelvis varied considerably even in cases in which there were no signs of fecal masses in the rectum. The position of the intestinal loops may have been arrested by the presence of fairly large amounts of a heavy contrast medium, but anatomical variations probably played a more decisive part.

The shadow of small intestine loops varied remarkably little on frontal views. The caudal margin seldom passed caudad to pars acetabularis ossis pubis. As for the rectal study, however, the extent of the small intestine must be based on comparison with the side view. For a large angle of inclination, fecal masses in the rectum or other obstructions to entry of the small intestine into the dorsal part of the true pelvis may have the result that the caudal contrast contour on frontal views is caused by intestinal loops located too far ventrad. This eventuality is particularly important when the effect of straining is to be estimated. The relations of the caudal margin to the bony pelvis is affected also by the dorsoventral depth which is individually variable. As in the case of the rectum, the side view is consequently superior for evaluations of contrast distribution and relations to the bony pelvis.

The caudal contour of the small intestine shadow may be convexly rounded (Fig. 15). In such cases the small intestine does not enter the rectogenital pouch. But more often the caudal contour is concave with the dorsal part projecting farther towards the pelvic outlet more or less like a cone, the tip of which signifies how far the small intestine reaches towards or into the rectogenital pouch (Figs. 16—19). Both these patterns and intermediate transitions between them occur in men as well as in

Fig. 15. Side view of pelvis from a man aged 24, with contrast in the small bowel. Note convex shape of the caudal contrast contour.

Fig. 16. Side view of pelvis from a man aged 28, with contrast in the small bowel. Note concave shape of the caudal contrast contour.

Fig. 17. Side view of pelvis from a woman aged 27, with contrast in the small bowel. Note concave shape of the caudal contrast contour.

Fig. 18. Side view of pelvis from a woman aged 25, with contrast in the small bowel. Note concave shape of the caudal contrast contour—the cutout marks the position of the uterus.

Fig. 19. Side views of pelvis from a woman aged 26, with contrast in the small bowel. The configuration of the caudal contrast contour varies with the position of the pelvic floor: A. Without contraction; B. With contraction; C. During straining.

TABLE 9.[1]

Extent of small bowel in true pelvis	Men			Women			Difference men—women
	No.	M ± ε (M)	σ	No.	M ± ε (M)	σ	
Dorsally	47	7.13 ± 0.25	1.74	47	6.96 ± 0.13	0.91	0.17 ± 0.28
Dorsally during straining	47	7.76 ± 0.28	1.90	46	7.68 ± 0.16	1.11	0.08 ± 0.32
Ventrally	47	5.97 ± 0.17	1.14	47	6.23 ± 0.13	0.91	0.26 ± 0.21
Ventrally during straining	47	6.40 ± 0.19	1.29	46	6.88 ± 0.17	1.14	0.48 ± 0.26

women. In women the caudal contrast contour sometimes has a marked cut, usually near the middle, sometimes more dorsad but oftener farther ventrad (Fig. 18). This cut is probably due to the uterus and plicae latae, and thereby it should be possible approximately to determine their dorsoventral position. Contraction of the pelvic floor may affect the shape and position of the caudal contrast contour. Thus, as seen in Fig. 19 b, isolated contraction of the pelvic floor may elevate and flatten it. Straining, on the other hand, often depresses the caudal contrast contour, as displayed in Fig. 19 c. A quantitative estimation of small intestine protrusion into the true pelvis and of its displacement by straining is given in Table 9.

The table reveals that no significant difference was found between the sexes with regard to the relative values for small bowel descent into the true pelvis, as measured from the pelvic inlet, nor with regard to caudad displacement of the small intestinal margin in straining. The sex difference as to the positions of the coccyx tip and the anorectal ring makes the craniocaudal distance from these to the caudal margin of the small intestine shadow greater in men than in women.

Summary of the the Author's Observations

Palpatory examination in 40 cases to ascertain what happens to the ventral wall of the rectum in straining revealed little or no caudad protrusion of the ventral rectal wall relative to the base of the prostate or the vaginal portion, nor did the latter undergo any appreciable caudad displacement.

Palpatory examination in 40 laparotomized patients of the width, depth, and contents of the pelvic peritoneal cavity showed that the caudal

[1] The means and standard errors given are not absolute values but proportionals obtained by reduction to a standardized value of 10 for the median diameter of the pelvic inlet (cf. p. 23).

part of the rectogenital pouch was empty in more than half the cases and consisted of a narrow dorsoventral fissure about as often. The bottom of the pouch as a rule lay immediatelly caudad to or in level with the base of the prostate or the vaginal portion. In only 5 cases dit it continue as far as 1 cm caudad of these reference points. Owing to sources of error inherent in the method the results of rectal and intraabdominal palpation are of value mainly for comparison with findings in the abnormal cases.

Roentgenological examination disclosed the various shapes and positions of the rectum at different ages and in the two sexes and at various degrees of contraction of the pelvic floor. A description is given of the position and caudad displacement of the latter in upright position. The various measurements were taken in relation to the pelvic skeleton, and any differences between the sexes were noted. It appeared that in men the anorectal ring lies more craniad of the tip of the coccyx than in women.

The caudad extent of the small intestine into the true pelvis as visualized by roentgenography in upright position is described and the variations illustrated. The contrast shadow, narrowing caudad, was often conical, and straining displaced it caudad. The position of the caudal contrast margin and its displacement by straining was measured from the pelvic inlet and is given in figures proportionalized to the median inlet diameter. No statistically significant difference between the sexes was found, but in view of the sex difference with regard to the position of the tip of the coccyx and the anorectal ring the conclusion may be drawn that the caudal margin of small intestine is farther craniad to the pelvic floor in men than in women.

CHAPTER 2

Anatomy in Deep Rectogenital Pouch

Review of the Literature

It has long been known that the rectogenital pouch occasionally may be very deep. Ziegenspeck (1887), for example, found peritoneum reaching to the levator ani in 2 of 56 necropsies. In a few carefully studied cases of deep rectogenital pouch the rectogenital septum was completely missing (Uhlenhuth *et al.*, 1948). Most data on such abnormalities are drawn from clinical observations in cases of hernia or other peritoneal protrusions in the region of the pelvic floor. Sometimes these observations have been correlated with findings made at operation or autopsy. Casuistic reports on the subject are available from the beginning of the eighteenth century down to our times. Attempts to systematize the reports published have been made from time to time, but the difficulty of selecting from the heterogeneous material those forms of hernia which actually are associated with a deep rectogenital pouch makes it impossible to estimate their frequency or distribution.

Confusion is rife even with regard to distinctions between the rectogenital pouch and the different hernias protruding from it. Ebner (1887) and Zuckerkandl (1891) used the term "hernia imperfecta" when the peritoneal recess went down to, but not through, the pelvic floor. A hernia does not become manifest, according to Barret (1946), until peritoneum protrudes through the pelvic floor. Considering the complex structure of the latter, however, this distinction is often difficult to maintain, particularly when the rectogenital pouch protrudes more or less diffusely.

The path of the protruding peritoneal sac is largely determined by the structure of the pelvic floor. Ebner found in a series of 60 necropsies spaces of varying width between the levator ani and coccygicus muscles in 47 cases and between the latter muscle and the coccyx in 21 cases. Such spaces are weak points and become the site of most hernias through the pelvic floor (Watson, 1948). Another common site is the region between the dorsal rim of the urogenital diaphragm and the ventral

aspect of the rectum. An important localization in women is the space between the vagina and musculus transversus perinaei profundus. Hernias of this type through the pelvic floor usually present as soft, easily reducible protrusions in the perianal region or in the labia majora. A tympanitic percussion tone may be produced if they contain bowel. Strangulation naturally makes the hernia very taut and gives rise to symptoms of ileus.

The structure of the pelvic floor is such that a deep rectogenital pouch may protrude in other directions as well. Thus, under suitable conditions, the caudal orifices of the digestive and urogenital organs are chosen.

Clinically more or less resembling a rectocele, protrusions to the vagina have been called "vaginal hernia" (Ebner, 1887), "elytrocele" (Zuckerkandl, 1891) and "retrovaginal hernia" (Dixon, 1942). They get bigger and may even prolapse from the vagina when the patient is standing up, coughing or straining, but they usually disappear in recumbent patients and are therefore often overlooked at routine gynecological examinations. If such a protrusion contains bowel its surface is often rippled by peristaltic waves and reduction is accompanied by a gurgling sound (Dixon, 1942). It is occasionally combined with and, if so, often disguised by a rectocele (Simon, 1932; Bueerman, 1932; Masson, 1932; etc.). Digital exploration of the rectum (Simon, 1932), or of the rectum and vagina simultaneously (Miles, 1926; Dixon, 1942), preferably with the upright patient straining, seems to facilitate diagnosis. If at operation for rectocele the peritoneal protrusion is overlooked the symptoms reappear, quickly and unavoidably — a fact considered one of the surest signs of peritoneal protrusion by many authors (Masson & Simon, 1928, Masson 1932; Bueerman, 1932; Simon, 1932; Wilensky & Kaufman, 1940; Austin, 1946; Meigs, 1947).

Protrusions into the rectum have been termed "hedrocele" (Ebner, 1887), "rectal hernia" (Bertrand, 1927) and "intrarectal hernia" (Mignon, 1905). The clinical signs are reviewed briefly in Watson's (1948) monograph on hernias: "The anterior rectal wall is forced backward into the rectum" . . . "as the tumor increases in size it may pass beyond the anus and be mistaken for a prolapse of the rectum." Like a number of other authors Watson was still of the view that rectal prolapse differs fundamentally from rectal hernia. Spiesman (1946), on the contrary, under the heading "prolapse of the rectum" included the form that does not fall out through the anus: "Instead of pushing stool down by the mechanism of defecation the bowel wall is forced down instead, obstructing the passage of the stool. This condition is diagnosed

during digital palpation by asking the patient to bear down when the bowel will be felt to come down and meet the examining finger."

The appellation "enterocele" is applied jointly to intrusions in the rectum and in the vagina by a few authors (Ebner, 1887; Zuckerkandl, 1891; Bueerman, 1932; etc.). This group, however, is often considered to include both the above mentioned hernias through the pelvic floor and descents of the pelvic peritoneal cavity following prolapse of the uterus. Barret (1946), on the other hand, understood by "enterocele" or "cul-do-cele" solely a hernia through the pelvic floor between the rectum and vagina. Meigs (1947) limited the term "enterocele" strictly to a type of local, narrow-necked hernia starting from the dorsal aspect of the uterine cervix, continuing between the rectogenital folds and intruding into the vagina ventrally of the rectogenital pouch. Subscribing to this strict definition of an enterocele, Weed & Tyrone (1950) emphasized that it is very often accompanied by prolapse of the uterus. They based their opinion on a series of 52 cases.

The above types may also occur together or alternatingly. Zuckerkandl (1891) stated: "Vaginal- und Rectalbruch kommen vermöge der topographischen Verhältnisse fast stets combiniert vor; wird nämlich der bis dahin capilläre Spalt des Douglas'schen Raumes durch eintretende Eingeweide auseinandergedrängt so wird sowohl das Lumen des Mastdarmes als das der Scheide beengt und nur je nach dem Vorwiegen der Bruchgeschwulst gegen die Scheide oder den Mastdarm spricht man von Elytrocele oder Hedrocele."

One such case of protrusion to both the vagina and the rectum was described already by Petrunti (1875). His patient displayed symptoms of strangulation with peritonitis. The tumour was opened via the vagina, the hernial sac containing gangrenous omentum. The literature contains a number of similar reports of complications incidental to these types of hernia. Bueerman (1932) summarized them as follows: A. Interference with delivery, 10 cases; B. Hernia incised or excised due to error in diagnosis, with death, 3 cases; C. Pelvic abscess following delivery with spontaneous recovery, 2 cases; D. Rupture of hernia with evisceration and death, 2 cases; E. Rupture of hernia with recovery, 1 case; F. Rupture of hernia during delivery with recovery, 1 case; G. Death from incarceration of vaginal hernia, 1 case.

When the rectogenital pouch intrudes in the rectum and falls out through the anus a fairly well defined condition develops: true rectal prolapse. The opinion that this abnormality is associated with a deep rectogenital pouch was already expressed by Ludloff (1899) and Jean-

NEL (1899), and also WALDEYER (1899) concurred with regard to the pathogenesis. Later publications by QUÉNU & DUVAL (1910), MOSCHCOWITZ (1912), GRAHAM (1942), HULTÉN (1946), etc. have borne out this view, which seems to win ever wider acceptance.

Prolapse through the anus would be impossible unless the rectogenital pouch were not only deep but also capable of further distention. HULTÉN (1946) has pointed out that the peritoneum in such cases in addition to extending abnormally far caudad has a large number of wrinkles, sometimes loose and sometimes edematous, which are remarkably slidable on the underlying organs. As the prolapse develops the intrapelvic fascia stretches and, perhaps consequently, the diastasis grows wider between the two levator branches (GRAHAM, 1942). Eversion of the ventral rectal wall through the anus requires, as indeed GRAHAM pointed out, displacement of the rectum ventrad from the sacrum. This is a factor contributing to the straightening of the normally angulated rectum at its passage through the pelvic floor. The rectum as a result tends to become an almost straight tube situated quite far ventrad in the pelvis and having mesentery over a considerable part of its craniocaudal length. This is a sign of a serious weakening of the apparatus for rectal fixation, particularly the intrapelvic fascia and the many dense bands and cords coursing through it. The prolapse tends to widen the anal sphincter and, secondarily, to facilitate the descent of the prolapse. A manifest prolapse of the rectum presents as a series of voluminous, circular mucous folds round the rectal lumen whose orifice faces dorsad because, according to the herniation theory, the prolapse is mainly composed of the ventral wall of the rectum. Unless the anal mucosa is everted at the same time, it is encircled by a groove, often several cm deep, between the anal canal and the everted rectal wall. If the depth of this groove exceeds, say, 5 cm, a true rectal prolapse is not present. Instead an invagination in the rectosigmoid or more cranial parts of the colon has fallen out through the anus. When there is bowel in the peritoneal sac in the ventral part of the prolapse reduction is often accompanied by a gurgling sound. GRAHAM (1942) emphasized that a sure sign of the prolapse being a hernia from a deep rectogenital pouch is that it can be restored by pushing its ventral wall ventrad with a finger inserted in the rectum, while similar pressure dorsad is ineffective. The bowel enclosed in the peritoneal sac may become strangulated and give rise to symptoms of incarcerated hernia.

The anatomical background in defecation block following deep rectogenital pouch in a series of 17 cases is discussed in a preliminary paper

by the present author (Walldén, 1948). In these cases the pouch reached the pelvic floor and was often remarkably wide. The peritoneum occasionally descended ventrad on either or both sides of the prostate or vagina, but there were no manifest hernias through the pelvic floor. The pelvic floor in some of these cases was palpably depressed caudad round the anus, which was confirmed roentgenographically.

Snellman (1951) has also observed such caudad bulging of the rectum round the anus. Though he described his cases incompletely it can be inferred that some of them had signs of a deep rectogenital pouch. He attributed the rectal protrusions to acquired or congenital defects of the rectogenital septum.

Summary and Aims

Various types of protrusions caudad from a deep rectogenital pouch are surveyed. The early literature mainly deals with more or less manifest hernias through the pelvic floor, but also with protrusions into the rectum and vagina which in extreme cases can fall out through these organs, thus extending caudad beyond the pelvic floor. Many cases have occurred in gynecological practice and have usually been diagnosed at examinations for symptoms of uterine prolapse. Other cases have gone unnoticed until the hernia has caused more or less pronounced symptoms of incarceration or grown to a size making it impossible to miss.

The observations gleaned from the author's pathological cases must now be considered in the light of findings in the control series and of data from the literature. As in the case of the controls the discussion will deal with the rectum and pelvic floor separately from the pelvic peritoneal cavity and its contents.

The Author's Observations

Materials

The author's series was assembled among patients who complained of and were examined clinically for symptoms of rectal block. A roentgenological examination by the method described elsewhere was undertaken if digital exploration showed that the ventral wall of the rectum bulged far caudad when the patient was straining. Exploratory laparotomy was included in the examination whenever operative intervention was considered justified. To compare clinical and roentgenological findings a number of true rectal prolapse cases were included, in all of which an exploratory operation had disclosed a deep rectogenital pouch.

TABLE 10.

Distribution of Clinical Subjects.

Age Group, Years	Cases of Defecation Block							Cases of Prolapse			
	Men		Women				Total	Men	Women		Total
			Nulliparae		Others				Nulliparae	Others	
	Operated	Unoperated	Operated	Unoperated	Operated	Unoperated					
10—19	—	—	1	1	—	—	2	—	—	—	—
20—29	1	—	1	3	—	—	5	—	1	—	1
30—39	3	—	3	—	5	2	13	—	—	—	—
40—49	3	—	3	1	2	—	9	2	1	—	3
50—59	2	—	1	—	—	3	6	—	1	2	3
60—69	1	—	1	—	1	—	3	—	1	3	4
70—79	—	1	—	—	—	1	2	1	—	—	1
Total	10	1	10	5	8	6	40	3	4	5	12

According to these principles 40 patients with defecation block were assembled during the period 1946—1951 (Tables 10 and 11). Clinical and roentgenological examinations were performed in all cases and operations in 28. Not all the roentgenological measurements were used for the statistical analysis: the points of reference could not be determined accurately enough on some films. Because they were added after the beginning of the statistical treatment a few other cases were excluded from such analysis. Tables 12 and 13 give data concerning the measured cases.

The patients' constitution was appraised by routine. Most of them were of ordinary build, some were heavy-set with highly developed muscles, others were slender, asthenic or delicate. Most were lean or in moderate flesh and only a few were definitely overweight.

As a rule the physical examination revealed nothing noteworthy apart from the specific abnormality. In a few cases there was diffuse tenderness over the abdomen. The abdominal wall was remarkably yielding in one woman.

There were altogether 12 cases of true rectal prolapse (Tables 10 and 11), all of whom were examined and treated surgically in the years 1937—1951.

The patients with rectal prolapse were in good general health. Most of them were of ordinary build and in moderate flesh. A few were rather heavy-set, one or two were on the fat side and a small number were lean. The series included two psychiatric patients with compulsive straining. No noteworthy clinical observations were made apart from the rectal disorder.

Methods

Clinical. In addition to digital exploration the rectal examination often included proctoscopy and sigmoidoscopy and, if the occasion demanded, a gynecological examination. Palpation was done mainly to see what happened to the ventral wall of the rectum when the patient was straining, usually in supine position but occasionally standing

TABLE 11.

Key to the Surgical Clinics Diary Numbers.

I. Cases of Defecation Block.

Operated Subjects

Men

1.	413/51	22 years	Undergraduate	2.	588/47	30 years	Typesetter
3.	2296/47	35 years	Bricklayer	4.	1174/50	39 years	Accountant
5.	569/49	44 years	Chimneysweep	6.	3197/47	46 years	Smith
7.	3612/49	49 years	Butcher	8.	1557/47	50 years	Carpenter
9.	2136/51	56 years	Builder	10.	1868/46	65 years	Farm hand

Nulliparous women

11.	705/47	17 years	Miss	12.	3677/48	25 years	Mannequin
13.	3469/47	30 years	Housewife	14.	1998/47	33 years	Waitress
15.	1672/48	36 years	Office worker	16.	3557/48	40 years	Teacher
17.	451/50	43 years	Housewife	18.	365/47	47 years	Nurse
19.	936/50	50 years	Miss	20.	43/47	63 years	Housewife

Parous women (all housewives)

21.	766/47	30 years	3-para	22.	1223/49	30 years	1-para
23.	526/47	31 years	1-para	24.	3699/47	36 years	4-para
25.	1343/48	39 years	2-para	26.	2997/50	45 years	4-para
27.	1857/48	48 years	1-para	28.	798/47	60 years	1-para

Nonoperated Subjects

Men

29.	449/49	70 years	Hospital attendant, ret.

Nulliparous women

30.	O.P.-/49	18 years	Factory worker	31.	O.P.-/47	21 years	Undergraduate
32.	O.P.-/48	23 years	Nurse	33.	O.P.-/51	25 years	Maid
34.	273/47	43 years	Housekeeper				

Parous women

35.	1074/47	31 years	2-para	Housewife
36.	2894/48	31 years	5-para	Housewife
37.	268/47	54 years	1-para	Housewife
38.	456/47	58 years	3-para	Shopkeeper
39.	1475/47	58 years	6-para	Housewife
40.	O.P.-/51	73 years	4-para	Widow

II. Cases of Rectal Prolapse.

Men

41.	2022/38	40 years	Psychiatric case	42.	2261/38	40 years	Psychiatric case
43.	515/49	77 years	Farmer, ret.				

Nulliparous women

44.	483/51	27 years	Maternity consultant	45.	1494/47	47 years	Housekeeper
46.	1633/47	56 years	Housewife	47.	34/42	61 years	Housewife

Parous women (49.: Housekeeper; rest: Housewives)

48.	326/48	52 years	5-para	49.	2165/47	55 years	2-para
50.	2856/47	62 years	2-para	51.	3510/43	64 years	2-para
52.	3156/43	67 years	1-para				

O.P. = out-patient

up. Although not recorded consistently in the earlier cases, the following main items were considered: 1. The effect of strain on the ventral wall of the rectum. 2. The contents and mucous membrane of the rectum. 3. The pelvic floor and anal canal.

Surgical. Laparotomy via an infraumbilical longitudinal incision was performed in all but two cases where Pfannenstiel's transversal incision was used. The supine patients were placed in horizontal position and — except for two cases under general anesthesia — the striated musculature of the abdominal wall and pelvic floor was completely paralyzed by spinal anesthesia. The controls — most of whom were operated on for disorders of the stomach or biliary tract — underwent palpatory exploration only. The patients, on the other hand, were examined both visually and digitally. Since the significant items emerged gradually during the course of the investigation, they were not recorded consistently from the beginning. A definitive constellation of factors was nevertheless evolved in time. Thus: 1. The extent of the rectogenital pouch. 2. The contents of the rectogenital pouch. 3. The appearance of the peritoneum. 4. The sigmoid colon and rectum. 5. The uterus and uteroinguinal ligaments. 6. The pelvic floor musculature.

Roentgenological. See p. 23 and 30.

I. Rectum and Pelvic Floor

A. Inspectional and Palpatory

1. *Cases of Defecation Block*

The below account is illustrated by diagrammatic drawings of marked but typical patterns. The corresponding roentgenological and operative findings are also shown for the sake of topographical orientation.

Effect of Straining on the Ventral Rectal Wall. The displacement of the ventral wall of the rectum during straining was the most remarkable and, perhaps, most characteristic observation made by digital exploration. In almost all cases it intruded into the lumen and towards the anorectal ring. The degree of caudad intrusion varied. In some cases it was slight, in the majority plainly noticeable, and in at least 15 cases the ventral wall of the rectum bulged down to the anorectal ring, sometimes causing anal obstruction. The bulge caudad could become more marked when the patient was examined in upright position. It was reversible in most of the younger patients, even if it sometimes persisted – at least to some extent — for a while after the patient had stopped straining. A few of the elder patients, on the contrary, had a remarkable caudad bulge even before they had started bearing down.

Apparently the uterus is often abnormally mobile in the presence of defects of the type we are dealing with here. This makes evaluation a difficult matter in women. In men palpatory examination is usually simpler and less variable, because the prostate is more firmly affixed to the pelvic floor. The intrusion caudad of the ventral rectal wall feels like a soft mass which in straining slides down past the dorsal aspect

Fig. 20.

Fig. 21.

Fig. 22.

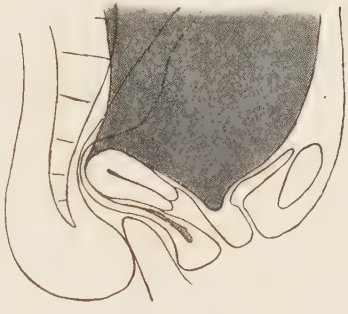

Fig. 23.

Fig. 20, 21, 22, 23. Diagrams showing the palpatory conception of the ventral rectal wall, the prostate or uterus and vagina, and the rectogenital pouch during straining in some patients with defecation block.

of the prostate (Fig. 20), in pronounced cases covering the whole of its dorsal aspect, in less pronounced cases a smaller portion thereof. Examples of various degrees were found among the male patients. It should be noted, though, that even if the caudad bulge falls short of reaching the caudal margin of the prostate it may nevertheless reach the anorectal

ring, provided the pelvic floor is situated unusually far craniad relative to the prostate.

By bidigital exploration from rectum and vagina the caudad bulge in two young nulliparae (Cases No. 12 and 32) reached almost to the skin, the anus and caudal orifice of the vagina being very close together (Fig. 21; cf. roentgen film, Fig. 39). During straining the rectovaginal wall, which otherwise was normal, seemed to be filled out by a soft linguiform mass. The rectum was compressed and the vagina unaffected by the bulge in both cases. In most of the cases the soft intrusion filled the ampulla recti more or less completely, and in one (No. 25) the anus was even forced open during straining. (See Fig. 22; cf. roentgen film, Fig. 40.) And on top of the round dome of the everted ventral rectal wall there was an ulcer as big as the nail of the little finger.

A few small rectoceles and cystoceles but no uterine prolapses were seen among the females. Instead there were various degrees of dorsad dislocation of the uterus. Apart from retroflexion in some instances, there were many cases of marked retroversion or retroposition of the uterus. It was then felt lying in the caudad intrusion in the ventral wall of the rectum. In addition to making the bulge very big, straining pressed the uterus caudad in such cases. (See Fig. 23.) Then it sometimes came into direct contact with the tip of the coccyx or with the pelvic floor or approached the cranial opening of the anal canal.

When a female patient was straining (Case 22) the cranioventral part of the rectum bulged but not towards the anus. The uterus lay in the bulge and its vaginal portion touched the tip of the coccyx. This woman was one of the two (Cases 16 and 22) whose peritoneal cavity dorsally of the uterus was not abnormally deep, as observed at operation.

The youngest patient with defecation block, a 17-year-old woman with characteristic symptoms (Case 11), had no caudad intrusion during straining when first seen. But when she returned 7 months later with aggravated symptoms there was a bulge reaching caudad right down to the anorectal ring. It was now decided to operate, and an abnormally deep and wide rectogenital pouch was found. One of the two women with a caudad bulge reaching far down between the anus and caudal orifice of the vagina showed no bulge until she was examined standing up and straining. These examples demonstrate how important it is to explore repeatedly whenever the expected result is not obtained right away.

Contents and Mucous Membrane of the Rectum. Prior to preparatory evacuation of the bowel the ampulla recti was palpably empty in 13

cases and in 2 cases it was abnormally wide and filled with scybala. Abnormalities were found in 9 of the 21 sigmoidoscopic cases. In 4 cases the transversal infolds were fairly prominent. One such fold was remarkably hard in a woman and straining moved it caudad so that it completely blocked the lumen of the bowel. The mucosa seemed normal in most cases and unusually rugose in others. In 3 cases it was remarkably mobile and was invaginated 1—2 cm into the sigmoidoscope when the patient was straining.

Pelvic Floor and Anal Canal. The part of the pelvic floor between the anus and the caudal opening of the vagina – – largely the perinaei profundus muscle and the perineal body with offshoots from the pelvic fascia converging on it — was studied specially at the gynecological examinations. This region had considerable dorsoventral scope in some cases and was palpably very firm. But cases of small dorsoventral breadth were also found. The latter applied particularly to a few of the young nulliparae. But it could still be firm, while it was extremely weak in a few cases of considerable dorsoventral breadth, consisting almost wholly of skin.

The anal canal and sphincters seemed normal in almost all cases. Painful sphincterospasm making exploration difficult was present in two cases only, slight in one and more severe in the other. In a few cases sphincteric function was somewhat impaired and in one (No. 25) straining opened the anus, just revealing the caudad bulge of the ventral wall of the rectum (Fig. 22).

Digital exploration of the pelvic floor revealed abnormalities in some cases. The floor had a pit-shaped depression caudad in 4 males, either surrounding or laterally of the sphincters, in one case asymmetrically and in one case as a diverticular hollow (Case 9; cf. roentgen film, Fig. 24). Some women, among them a couple of nulliparae, had overseparated levator branches which in a few of them were weak. In most cases, however, the levator was palpably normal. A male patient's pelvic floor was situated comparatively far craniad, and another's coccyx curved so sharply ventrad that it formed a firm platform in the dorsal part of the pelvis. A remarkably similar picture was seen in one of the female patients.

2. *Cases of Prolapse*

The youngest patient, a 27-year old nullipara with initially prominent rectal prolapse from age 10—11, is rather interesting from anatomical points of view. When she stood up palpatory exploration revealed the

ventral wall of the rectum bulging into the ampulla recti, when she started straining the region between the rectum and vagina — which at first was like a thin wall — was gradually distended by a soft mass. Initially this mass reached almost to the skin, but continued straining made it fall out through the anus (cf. roentgen film, Fig. 48). Consisting mainly of the ventral but also of a bit of the dorsal wall of the rectum, the prolapsed part was 6—7 cm long. The foldover was exactly at the juncture of skin and mucous membrane. Compression made the ventral aspect of the prolapse smaller. Spontaneous reduction of the prolapse to the condition originally found by digital exploration occurred as soon as the patient stopped straining.

Secondary changes such as swelling or even ulceration of the prolapse had occurred in the other cases owing to the long duration of the disorder. In these subjects, who often were very old, weakened pelvic floor musculature and, particularly, loss of sphincteric tone made it difficult to locate the anatomic landmarks.

The prolapse often did not emerge from the anus unless the patient was straining, defecating or walking about. Some patients had very ineffective sphincters. As a rule the prolapses were easy to reduce. Once, however, reduction was so difficult that anesthesia had to be used. The prolapses varied in size: the smallest was plum-sized, the largest as big as two fists. In a number of cases the ventral portion was much larger than the dorsal, and one large prolapse consisted almost wholly of the ventral rectal wall. Mostly the larger ventral portion was easy to compress, but "bowel sounds" were not heard during that process. In these patients the rectal orifice was situated far dorsad, in one case almost adjoining the borderline between skin and mucous membrane. The foldover between the anal canal and the prolapse lay 1—2 cm craniad from the caudal anal orifice in most cases; and, at least dorsally, it lay in one patient (No. 37) cranially beyond the reach of the examining finger. A section of the sigmoid colon was evidently enclosed in the prolapsed mass of bowel. In a few instances, however, there was direct transition between the anal canal and the prolapse, indicating that the anal mucous membrane had prolapsed also.

B. Roentgenological

1. *Cases of Defecation Block*

Shape and Position of the Rectum. The rectal contrast shadow showed no fundamental differences between most of the patients and the controls.

The variations were on the whole similar in both groups. It should be noted, however, that all the female patients but only about half the number of the male patients had a rectal shadow extending caudad beyond the pelvic outlet.

Marked deviations were noted in solitary cases, either in the form of pelvic floor defects or of aberrant positions of the rectum in the true pelvis. To take an example, a man aged 56 (Case 9) had dorsally on one side a diverticular protrusion caudad from the rectum (Fig. 24), corresponding to a local depression plainly palpable in the pelvic floor. A more extensive depression round the anal canal occurred in a patient aged 65 years (Case 10; Fig. 25) in whom advanced levator atrophy was found by both digital and caudal operative exploration. The depressed ampulla recti lay dorsally between the separated, paper-thin levator branches. Roentgenographs showed this abnormal position plainly. They revealed that the caudal part of the rectum was remarkably straight and ended at an anus which was situated far dorsocaudad.

An old woman without defecation troubles dispalyed a similar depression of the pelvic floor round the anal canal (Fig. 26). She had neither roentgenological nor clinical signs of a deep rectogenital pouch. It is interesting to note that an almost identical picture was seen in a middle-aged man with paralysis of the legs and pelvic floor following poliomyelitis during childhood.

The ventral contour of the female rectum is particularly interesting, for its configuration should ordinarily disclose the presence of rectoceles on roentgenographs of the patient standing upright with contrast in the rectum. If not before, they should appear when the patient is straining. The characteristic roentgen pattern of rectocele may be illustrated by a patient without defecation disorders but with palpable weakness of the rectovaginal wall (Fig. 27). Only one single defecation block case had a similar roentgen pattern.

These protrusions of the ampulla recti caudad into the pelvic floor or ventrad into the vagina are, as noted, exceptional. Exactly how these abnormalities are related to the abnormal depth of the rectogenital pouch, it is impossible to say. Evidently, however, such protrusions need not be connected with a deep rectogenital pouch, or cause defecation disorders. Yet, in one of the cases illustrated (No. 10) the depression of the pelvic floor and the abnormally deep rectogenital pouch seem to be associated. The frontal view of the rectal shadow (Fig. 25) and the frontal view of the pelvic small bowel shadow (Fig. 42) both display approximately the same position and shape of the caudal contrast

TABLE 12.[1]

	Cases of Defecation Block			Controls			Difference between block cases and controls
	No.	M ± ε (M)	σ	No.	M ± ε (M)	σ	
Angle of pelvic inclination	25	52.20 ± 1.28	6.41	50	53.06 ± 0.89	6.26	0.86 ± 1.56
Median diameter of pelvic outlet	25	7.96 ± 0.19	0.93	50	7.87 ± 0.11	0.81	0.09 ± 0.22
Length of sacrum-coccyx axis	25	9.38 ± 0.17	0.87	50	9.12 ± 0.09	0.64	0.26 ± 0.19
Craniocaudal position of anorectal ring	25	9.48 ± 0.19	0.97	50	9.06 ± 0.08	0.66	0.42 ± 0.21
Craniocaudal position of anorectal ring during straining	22	11.33 ± 0.32	1.48	47	9.98 ± 0.14	0.96	1.35 ± 0.35

contours. This indicates that the bottom of the rectogenital pouch lies very close to the depressed pelvic floor, whose musculature was severely atrophied and lacerated in this case. It cannot be determined whether the pelvic floor defect or the abnormal depth of the rectogenital pouch came first, or whether both developed concurrently.

The rectum of an old man with defecation block had undergone dislocation ventrad in the true pelvis, indicating that the mesentery was abnormally high. Consequently the picture resembled that seen in certain cases of rectal prolapse.

Sometimes dorsad dislodgement of the uterus is visualized on films which are exposed after most of the contrast has been allowed to escape. Dorsally in the true pelvis one sees in such cases a rounded filling defect apparently compressing the rectum more or less (Case 36; Fig. 28). A patient without operative signs of an abnormally deep rectogenital pouch (Case 22; Fig. 29) had a palpable and roentgenological impression quite far craniad in the rectum, which was accentuated by straining.

Films exposed during straining occasionally showed the cranial part of the rectum descending to the bottom of the rectogenital pouch whose abnormal depth was rendered manifest thereby (Case 6; Fig. 30).

Position of the Pelvic Floor and Its Movement During Straining. Since the patients with defecation block were less numerous than the controls and, particularly, since the men were relatively few, comparisons between the two groups would not yield reliable results. The statistical analysis

[1] The means and standard errors given are not absolute values but proportionals obtained by reduction to a standardized value of 10 for the median diameter of the pelvic inlet (cf. p. 23).

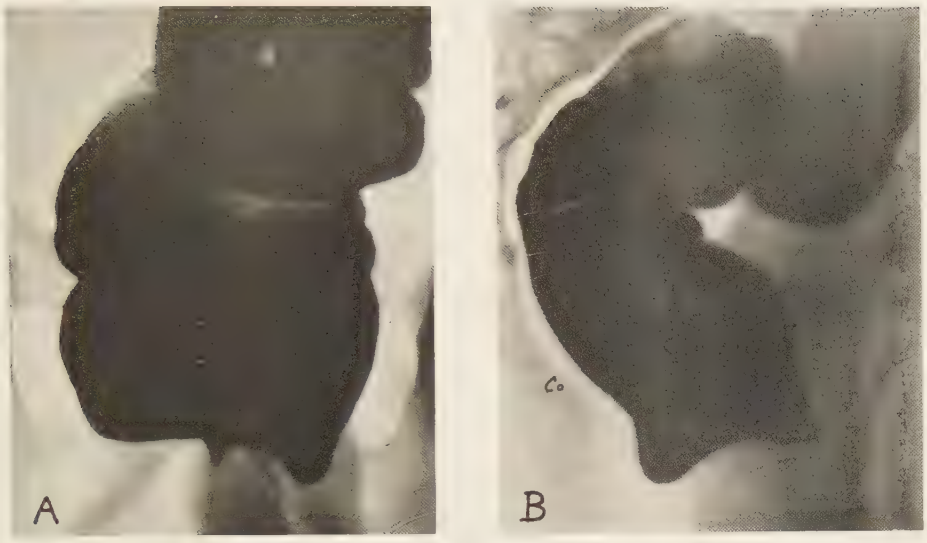

Fig. 24. Frontal and side views of the contrast-filled rectum of a 56-year-old man with defecation block. Note the diverticular depression in the ampulla recti to the left and dorsally of the anus.

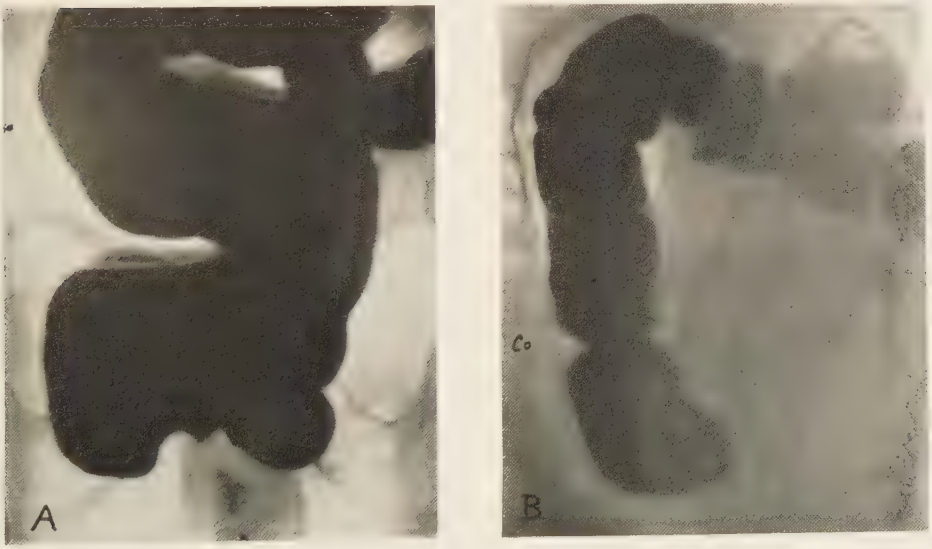

Fig. 25. Frontal and side views of the contrast-filled rectum of a 65-year-old man with defecation block. Note descent of the ampulla recti on either side of the anus which is situated uncommonly far dorsad.

Fig. 26. Frontal view of the contrast-filled rectum of a 62-year-old woman without defecation block. Note descent of rectal ampulla at the sides of the anus.

Fig. 27. Side view, when most of the contrast has been voided, of the rectum of a woman of 32 without defecation block. Rectocele.

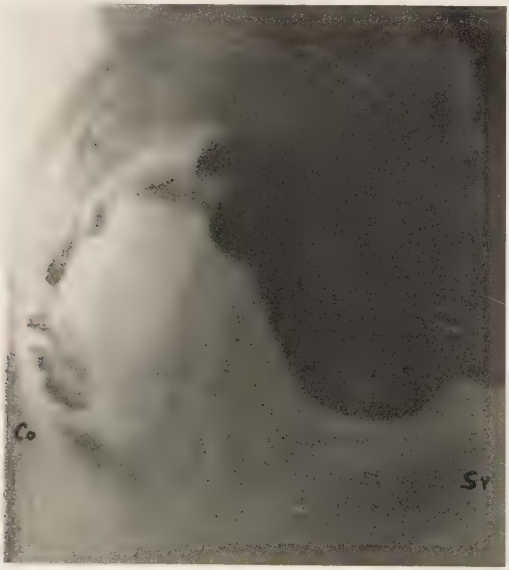

Fig. 28. Side view, when most of the contrast has been voided, of the rectum of a woman of 31 with defecation block. Rectal compression owing to dorsocaudad uterine dislocation.

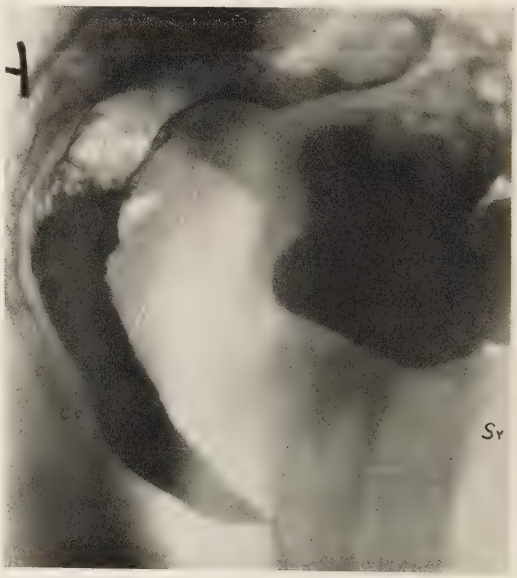

Fig. 29. Side view, when most of the contrast has been voided, of the rectum of a woman of 30 with defecation block. Rectal compression cranially owing to dorsad uterine dislocation.

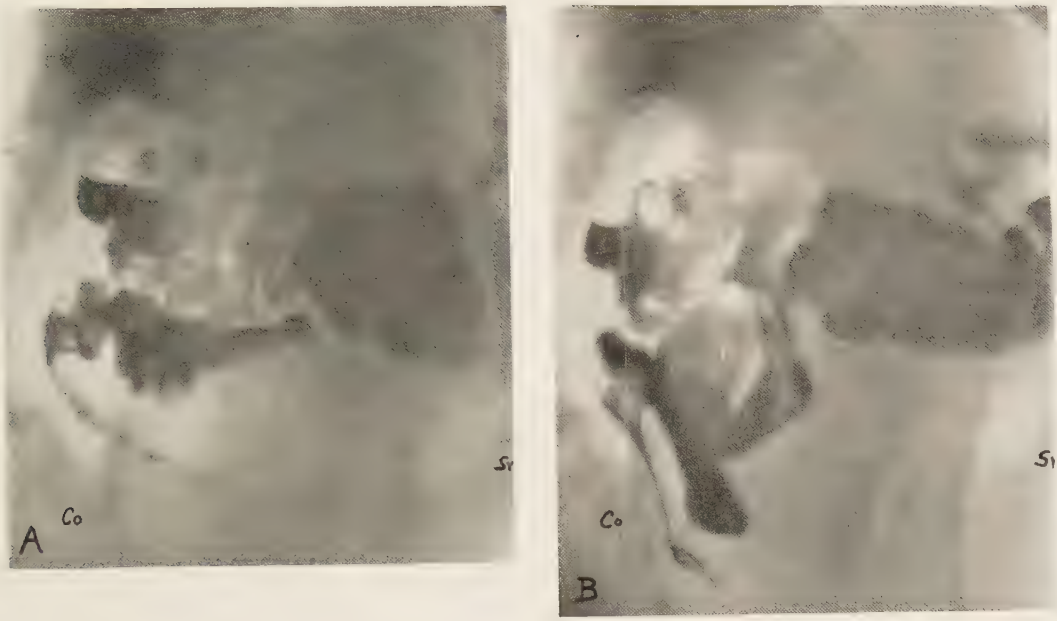

Fig. 30. Side views, when most of the contrast has been voided, of the rectum of a man of 46 with defecation block. A. Without strain. B. During straining—caudad displacement to the pelvic outlet of the rectosigmoid.

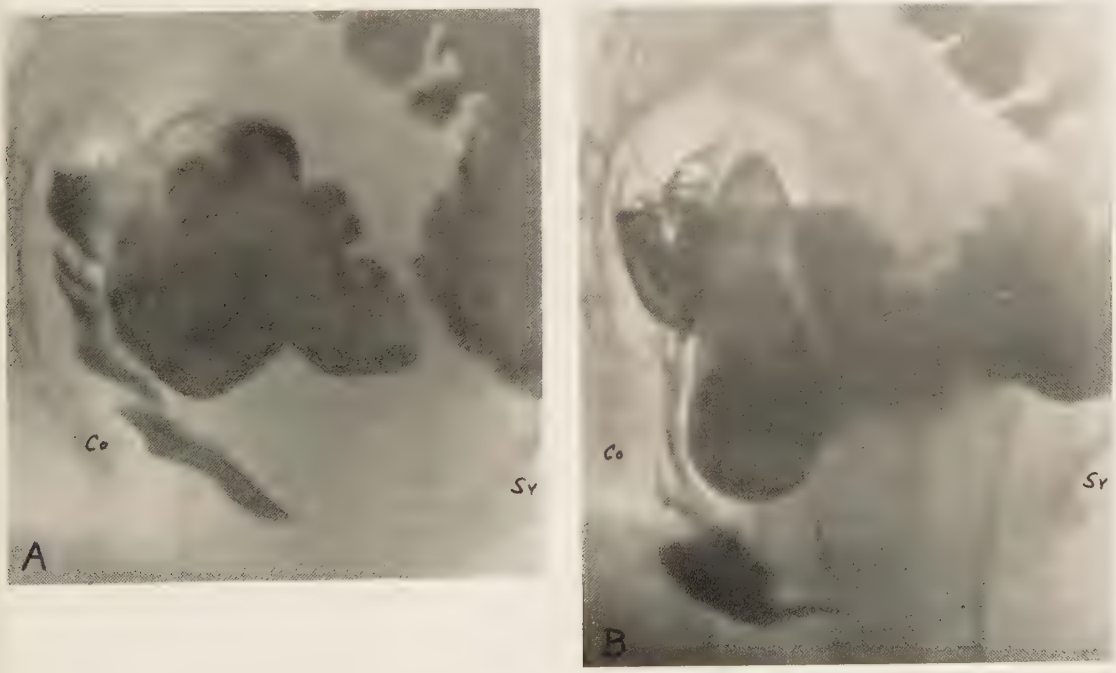

Fig. 31. Side views, when most of the contrast has been voided, of the rectum of a woman of 23 with defecation block. A. Without strain. B. During straining—caudad displacement of the pelvic floor.

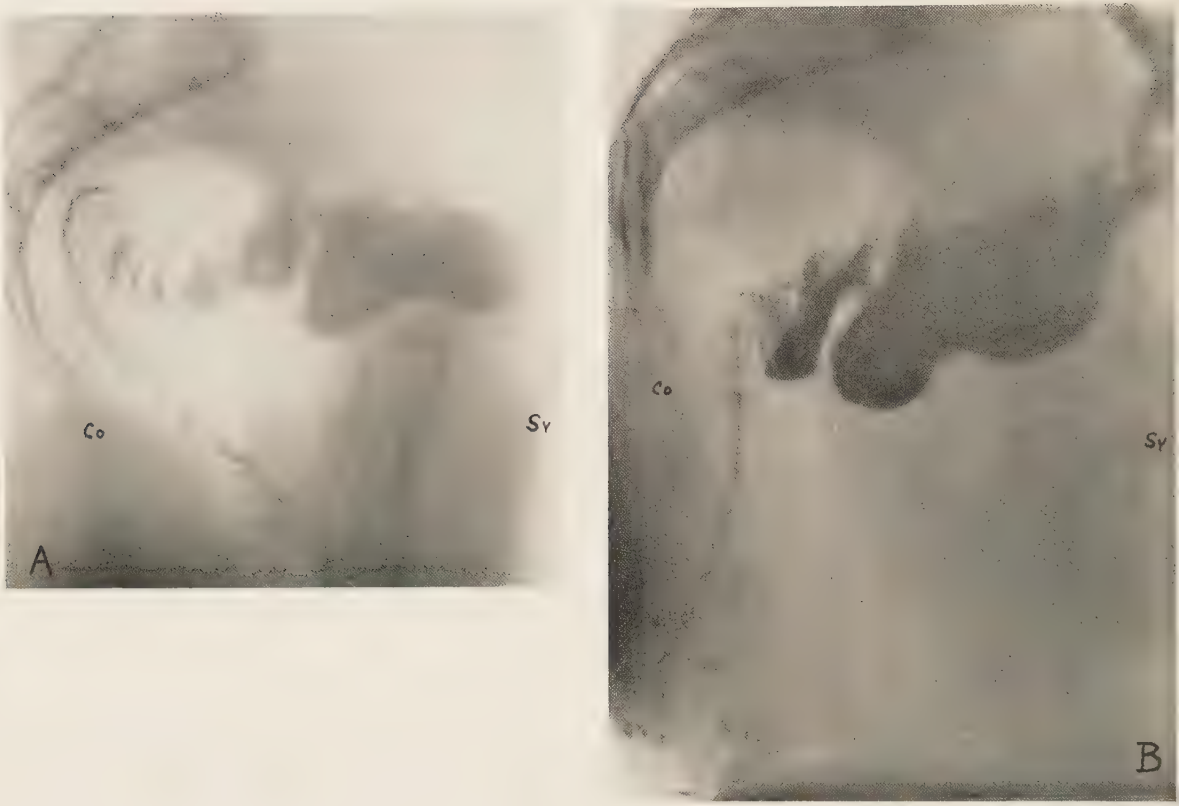

Fig. 32. Side views, when most of the contrast has been voided, of the rectum of a woman of 27 with rectal prolapse. A. Without strain. B. During straining—displacement ventrad in the true pelvis of the rectum when the prolapse has fallen out.

of the position of the anorectal ring and of how it moved relative to the bony pelvis during straining was therefore based only on figures from the female subjects. Among the patients with defecation block both sexes displayed varying degrees of caudad displacement, just as in the controls. A fairly pronounced example is shown in Fig. 31 (Case 32).

The mean levels, with and without straining, in patients with defecation block and in controls of the anorectal ring relative to the bony pelvis are given in Table 12. At a glance it reveals that the two groups show good agreement with regard to the position and shape of the bony pelvis. Between the two groups there is no statistically significant difference in the position of the anorectal ring without straining. But the significant difference when the subjects were straining shows that the anorectal ring tended to move farther caudad in the patients with defecation block.

2. *Cases of Prolapse*

The contour of the rectal shadow in side projection was abnormal in some of the patients with prolapse of the rectum. Admittedly changes were difficult to observe when the prolapse was reduced and the rectum filled with contrast, but typical deviations appeared when the prolapse had fallen out. Then, in addition to caudad displacement of the lumen, one could see ventrad dislodgement in the true pelvis (Case 44; Fig. 32). Such displacement is due to an abnormally high rectal mesentery and without it the prolapse would not be able to fall out.

The small number of cases warrants no numerical evaluation. Yet a number of remarkable observations were made in the six cases measured. Averaging 44.8°, the angle of inclination was consistently small; and, having a mean of 8.70, the median diameter of the pelvic outlet was rather long. It two cases it was 12.7 and 11.5 and straining lengthened it to 13.4 and 13.7, respectively. Moreover, the mean craniocaudal level of the anorectal ring, 9.68, exceeded the corresponding means in the controls and in the patients with defecation block.

II. The Pelvic Peritoneal Cavity and its Contents

A. Laparotomical

1. *Cases of Defecation Block*

Since too sketchy a presentation would not bring out the great variation of the findings which are actually made at laparotomy, the subject will

here be discussed rather fully. The most important observations are summarized at the end of the chapter, and a general impression can be formed from the diagrams (Fig. 20—23 and 33—35).

Extent of the Rectogenital Pouch. Digital estimation of the depth of the rectogenital pouch is facilitated by certain anatomical landmarks. For our purposes the tip of the coccyx and the cranial orifice of the anal canal were selected. Moreover, the distance was estimated from the bottom of the pouch to the prostate or to the uterus and vagina.

The rectogenital pouch of 5 men extended caudad beyond the tip of the coccyx which was paplable through its dorsal wall. In 3 other men the tip of the coccyx could be felt immediately caudodorsally of the bottom of the pouch. In 6 of the women the coccyx tip lay cranially of the bottom of the rectogenital pouch — in one case as much as 4 cm. Four of these women were nulliparous. Six other women had a pouch whose bottom was in level with the tip of the coccyx which in most of them was felt immediately caudodorsad to the bottom.

The cranial orifice of the anal canal was in most cases palpable from the bottom of the rectogeniatl pouch, either straight caudad or farther ventrad. One man (Case 6) had an additional depression which was about 1 cm deep round the anal sphincter, the latter masquerading as an eminence projecting from the pelvic floor. Two young nulliparae (Cases 11 and 12) had a depression a few cm deep ventrally of the anus, and in two cases (Nos. 11 and 15) the pouch like a horseshoe embraced the dorsal aspect of the vagina. Similar protrusions ventrally of the anus were seen in two other women and in one man.

In 8 of the 10 men the dorsal aspèct of the prostate was wholly invested by peritoneum, and the rectogenital pouch in 4 of these men extended farther caudad 1 cm or more. In another case a diverticular protrusion extended ventrad on one side of the anal canal and prostate. The remaining man, who was operated on first, had an anomalous rectogenital pouch such as is seen in rectal prolapse. Consequently the peritoneum on the dorsal aspect of his prostate must at least have extended as far caudad as in the other men.

The peritoneal coating extended unequally far caudad on the dorsal aspects of the uterus and vagina. In two young nulliparae the bottom of the rectogenital pouch lay 8—10 cm caudad of the vaginal portion (Cases 11 and 13). In two other cases the dorsal aspect of the vagina was wholly invested by peritoneum. In yet another patient (No. 17: Fig. 33; roentgen film, Fig. 37) the pouch continued caudoventrad as an egg-sized pocket dorsally of the caudal part of the vagina. Similar

Fig. 33.

Fig. 34.

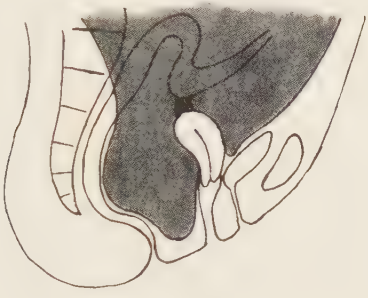

Fig. 35.

Fig. 33, 34, 35. Diagrams showing laparotomy views of the shape and extent of the rectogenital pouch and of its relations to the prostate or uterus and vagina, and to the rectum and pelvic floor in some patients with defecation block.

findings were made in those women who had given birth to children. In both groups there were cases with the pouch protruding ventrally to the pubic arch on either or both sides of the vagina. Two cases departed from what was otherwise a consistent trend. The peritoneal investment in a nullipara (Case 16) actually came to an end a few cm cranially of the vaginal portion, and in a unipara (Case 22) it went caudad to a level just below the vaginal portion.

The bottom of the rectogenital pouch was mobile in some cases. It was capable of further depression in six patients, chiefly because it was more or less concentrically wrinkled and could be smoothed out by being pushed farther down. Extending caudad more than 2 cm beyond the tip of the coccyx, the rectogenital pouch in a nullipara (Case 15) could be pushed several cm farther by slight digital pressure. And had

the sphincter been patent, a man's (Case 5) peritoneal sac and ventral rectal wall could have been pushed out through the anus. Owing to craniocaudal mobility of the uterus of about 10 cm, the bottom of a unipara's rectogenital pouch — which, exceptionally, was not deep — was variably situated.

There were many different deviations with regard to the width of the rectogenital pouch which normally is a fissuriform lumen between the rectum and genital organs. The pouch was considered very wide both dorsoventrally and laterally in at least 16 cases. In one or two cases the width was remarkable. The youngest male patient, who was 22 years old, had a very deep and rather narrow-mouthed pocket extending caudad between the prostate and rectum, which cranially was well demarcated by the rectogenital folds. Similarly, a man of 39 (Case 3) had a very deep, narrow-mouthed, caudally wider rectogenital pouch. The usual rectogenital folds were here replaced by folds running from the promontory caudoventrad to the dorsal aspect of the prostate. These folds sharply demarcated the pouch cranially, cutting in deep from the sides and giving it the appearance of a uniformly wide sock (Fig. 34). The dorsoventral width of the rectogenital pouch was very narrow in some of the women, owing to retroversion or retroposition of the uterus. The width would become more imposing after the uterus had been pushed ventrad to its normal position.

To illustrate how wide the rectogenital pouch can be it will suffice to mention that the rectogenital folds were sometimes more or less absent. But the pouch was oftener widest farther caudad, where the many peritoneal pleats permitted not only depression of the bottom but also dorsoventrad and laterad distention.

Contents of the Rectogenital Pouch. In the majority of cases small bowel and loops of sigmoid colon filled the pouch right down to the bottom. Sigmoid colon sometimes lay caudad to the small bowel. The deepest part of the pouch in one patient (Case 16) contained twisted loops of rectum and sigmoid. Extending to the sacrococcygeal transition, this patient's rectal mesentery was very high. Thereby was created a caudal reduplication of the rectum whose cranial part could enter the caudalmost part of the peritoneal cavity. A similar abnormality was seen in another case (No. 20). Here, too, the rectal mesentery was high, enabling the cranial part of the rectum to sink to the bottom of the pouch. In a third case (No. 19) the retroflected uterus because of a necrotic myoma of the fundus had become adherent to the sigmoid colon over an area approximately 4 cm long. Depression of the uterus

seemed to take the sigmoid with it, bending it sharply (Fig. 35). Occasionally the small bowel lay at the bottom of the pouch with a loop of sigmoid on top, but more often both these viscera came down to the bottom. In as many as 10 cases, however, a retroflected, retroposed or retroverted uterus was more or less apposed against the bottom of the rectogenital pouch — 4 of these women vere nulliparous. In one woman (Case 26), whose slightly enlarged uterus with a fairly long collum that lay retroposed in direct contact with the pelvic floor and rectum, an abnormally deep genitovesical pouch had developed. It was almost as deep as the rectogenital pouch and contained plenty of small bowel, whereas only part of the sigmoid colon penetrated caudad between the uterus and rectum. In two other cases of uterine retroposition to the bottom of the pouch the plicae latae were horizontal and covered the bottom of the pouch laterally of the uterus.

We have seen that the rectogenital pouch was filled right down to the bottom in almost all cases. Some resistance was sometimes met with when the bowels were withdrawn from a deep and wide rectogenital pouch with a comparatively narrow opening, as when a hernia is reduced and the opening is a bit tight. The same occasionally happened on restoration to ist normal position of an uterus which, in a manner of speaking, was pressed against the pelvic floor and sacrum.

Appearance of the Peritoneum. The surface of the peritoneal lining in the rectogenital pouch was smooth and unwrinkled in 3 of the operative cases. It was slightly rugose in a couple of patients. In 6 cases the pouch was smooth all over except at the bottom. There, numerous concentric pleats when smoothed out, enabled the pouch to become even wider and deeper. In six other cases the entire peritoneal lining of the pouch was more extensively pleated, and in the majority of these the peritoneum was abnormally mobile. The peritoneum in two cases was thickened, uncommonly rich in connective tissue and had a leathery feel. Between the peritoneum at the bottom of the pouch and the dorsal aspect of the uterus there was myomatous adhesion in two cases, and in one case with saccular tubes there were cord-like adhesions between the uterus, the bottom of the pouch and the ventral aspect of the rectum.

Sigmoid Colon and Rectum. The sigmoid colon was considered very long in one man, relatively long in 5 women, not particularly long in 7 cases and relatively short in 3 cases. The rectum, as noted, sometimes had a high mesentery permitting reduplication and descent into the pouch of the cranial part. The mesentery was low in some other cases and absent in one or two. The rectum in such cases passed cranially

along the sacrum and did not enter the rectogenital pouch. As a rule the rectum and sigmoid colon were contracted and had little or no contents, but the contracted gut sometimes contained hard fecal masses.

Uterus and Uteroinguinal Ligaments. The size and shape of the uterus were normal in most cases. It was slightly enlarged in 3 cases and had quite a long collum in one. Solitary myomatous nodes were seen in two cases. In one of these (Case 19) the uterus and sigmoid were conjoined at the site of the myoma. In the other (Case 17) the myoma - which was as big as a dove's egg - had caused a slight laterad displacement of the caudal part of the rectum. The surface of the uterus was full of cicatrices and seemed sinewy. In another case (No. 15) a similar but more patchy thickening of the peritoneum imparted a pitted appearance to the surface of the uterus which, being retroverted, touched the tip of the coccyx past which the cranial margin could not slide without some friction. The same degree of retroversion was seen in yet another case. The position and fixation of the uterus in the true pelvis varied in the rest of the cases. Dislocation dorsad towards the rectum or pelvic floor occurred, as noted, in 10 instances, 4 being in nulliparae. At least extreme forms of this abnormality require long uteroinguinal ligaments. The latter were flaccid and atrophic in 6 cases, but occasionally the uterus was suspended by well developed and taut ligaments. Strong uteroinguinal ligaments fairly effectively maintained the dorsoventral position of the uterus in a woman with marked uterine retroposition, but nevertheless the organ touched the sacrum owing to its abnormal craniocaudal mobility.

Pelvic Floor Musculature. The levator in some cases had palpably normal firmness and little if any abnormal diastasis. In other cases there were plain signs of defects. For example, the fasciomuscular pelvic floor must be defective in cases of deep rectogenital pouch descending several cm farther ventrally of the anus. The same applies to the few cases of abnormal craniocaudal mobility of the uterus. The levator must have been defective in the case (No. 6) where the bottom of the peritoneal cavity was depressed round the anus. In the male patient (Case 10) whose levator at operation was very atrophic and looked like a thin curtain the pelvic floor musculature was markedly lacerated. Widening ventrally, there was a dorsal diastasis of 2—3 cm between the branches of the levator. Into this space the caudal part of the rectum had descended.

2. *Cases of Prolapse*

The rectogenital pouch was abnormally deep in all the 12 operative cases. Either the tip of the coccyx and the anal opening were palpable through its bottom, or it was even deeper. A deep diverticular depression was thus observed beside the anal canal in solitary cases, which would be impossible without a local defect in the pelvic floor musculature. In another case the examining finger could push the bottom of the pouch out through the sphincter and, in a manner of speaking, enter the prolapse from the inside.

Not only very deep but also remarkably wide in several cases, the rectogenital pouch in one patient was dorsoventrally rather tight. The youngest patient's (Case 44) peritoneum was smooth save at the bottom of the pouch where profuse wrinkling enabled the prolapse to fall out. Peritoneal rugosity seemed to encroach upon the lumen of the pouch in the other cases, particularly in the oldest patient (Case 43) whose rectogenital pouch was like a crumpled bag without noticeable space inside. Contributory to this space-encroachment there was often peritoneal and rectal edematous engorgement, as well as ventrad dislocation of the rectum by an abnormally high mesentery. In one case the edema was sharply demarcated cranially where a mesentery began to appear, promoting the circulation in and mobility of the affected viscera. Other signs of lesions additional to edema were present in some cases, e.g. in the form of patchy, indurated peritoneal thickenings and cords, in one case stretching caudad to the rectum and the deep rectogenital pouch from the dorsal aspect of the uterus.

The contents of the deep rectogenital pouch varied from case to case. Right down to the bottom the youngest patient's pelvic peritoneal cavity was filled with small bowel. Sometimes a long and mobile sigmoid colon entered the pouch. Twice the uterus was retroflected to the bottom of the sac which also contained fatty omentum and small bowel and sigmoid respectively. Small bowel and the uterus with its adnexa had descended into the deep pouch of yet another patient. In the oldest patient, however, the peritoneal rugosity was so marked and the ventrad dislocation of the rectum so great that none of the viscera descending from the abdominal cavity entered the rectogenital pouch.

B. Roentgenological

1. *Cases of Defecation Block*

The adopted roentgenological method suffers from the drawback of providing no direct information concerning the shape of the peritoneal

TABLE 13.[1]

Extent of small bowel in true pelvis	Cases of Defecation Block			Controls			Diff.: block-contr.
	No.	M ± ε (M)	σ	No.	M ± ε (M)	σ	
Dorsally	29	7.66 ± 0.22	1.17	47	6.96 ± 0.13	0.91	0.70 ± 0.26
Dorsally during straining	29	8.89 ± 0.34	1.82	46	7.68 ± 0.16	1.11	1.21 ± 0.38
Ventrally	29	6.87 ± 0.17	0.91	47	6.23 ± 0.13	0.91	0.64 ± 0.21
Ventrally during straining	29	7.85 ± 0.25	1.36	46	6.88 ± 0.17	1.14	0.97 ± 0.30

cavity. Visualizing only the small bowel shadow in the true pelvis, it justifies no conclusions regarding the depth of the peritoneal cavity unless the shadow extends unusually far caudad.

The defecation block series was selected by relating the patients' complaints to clinical observations and to the roentgen image of the small bowel contour in the true pelvis. Since the clinical schedule and the roentgenological experiences both grew gradually as the investigation went forward, a subjective factor has affected the evaluation of the roentgen patterns in a degree varying from case to case. Although an appreciable number of films were convincingly specific it cannot be helped, therefore, that some cases of defecation block have spilled over into a rather broad intermediate group. Much weight must consequently be attributed to a summarizing numerical analysis enabling comparisons to be made with the control group. The relevant data, which are based on the female cases only, are given in Table 13.

It shows that the small bowel contour, whether or not the patient was straining, lay farther caudad in the group with defecation block than in the controls, the difference being statistically significant. It also shows that straining displaced the contour farther caudad in the former group than in the latter.

Just as the laparotomy findings, the roentgenograms varied considerably in those cases in which the small bowel descended abnormally far. Though the small bowel margin could be normally situated at rest, straining often gave rise to a greater or lesser dislocation caudad. Different types could be distinguished by the shape and extension of the depressed small bowel. A good example of how straining makes small bowel enter a narrow-mouthed diverticular caudal protrusion from the rectogenital pouch is shown in Fig. 36 from a young man (Case 1). A

[1] The means and standard errors given are not absolute values but proportionals obtained by reduction to a standardized value of 10 for the median diameter of the pelvic inlet [cf. p. 23].

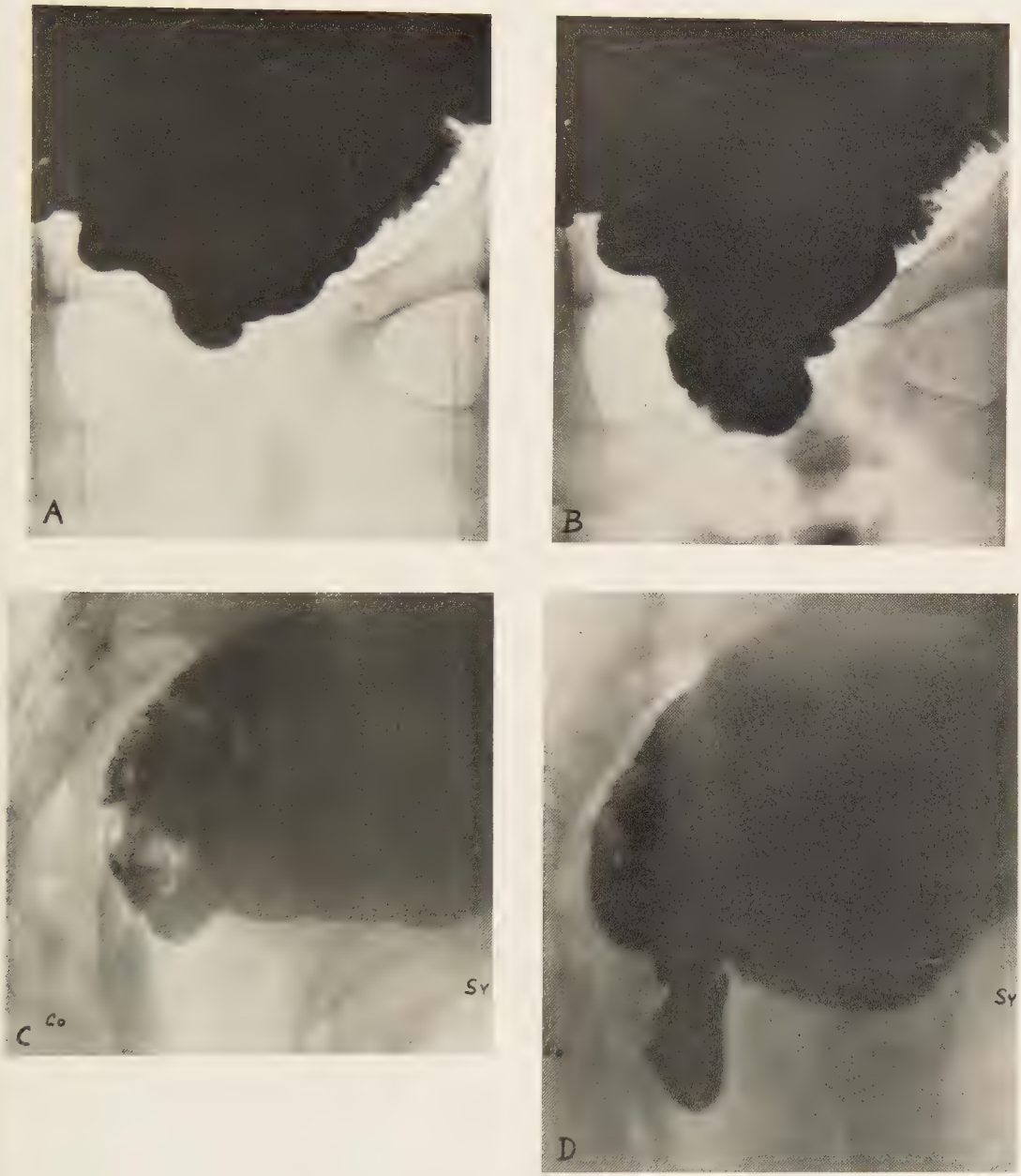

Fig. 36. Frontal and side views of the pelvis, with contrast in the small bowel, of a man aged 22 with defecation block. A and C: without strain. B and D: with strain, showing how a comparatively narrow section of contrast is being pressed downwards.

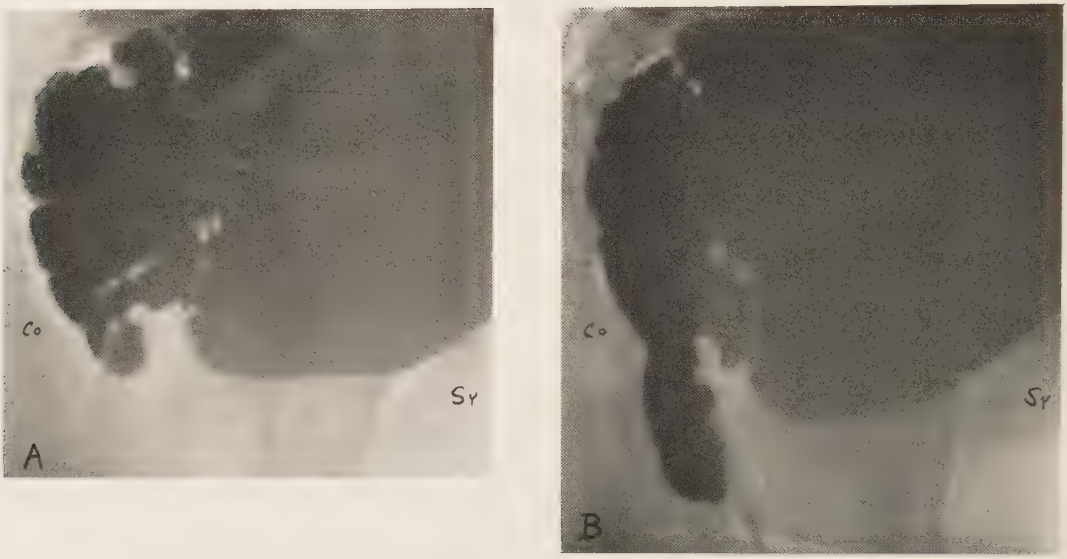

Fig. 37. Side views of the pelvis, with contrast in the small bowel, of a woman aged 43 with defecation block. A. Without strain. B. With strain, showing how a comparatively narrow section of contrast is being pressed downwards.

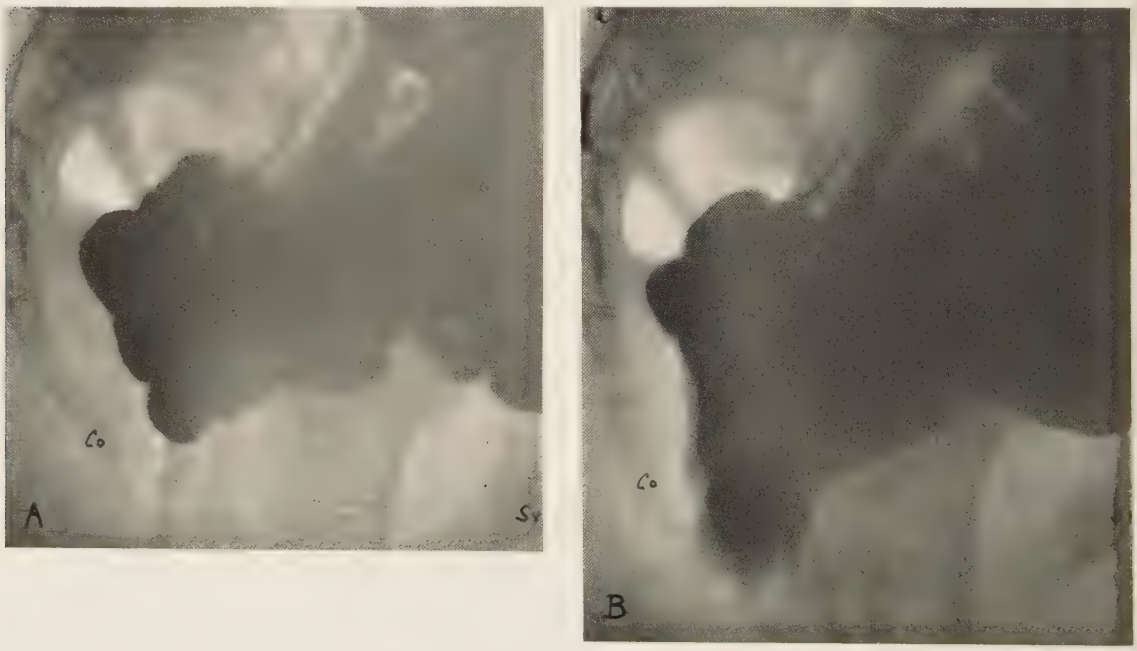

Fig. 38. Side views of the pelvis, with contrast in the small bowel, of a woman aged 23 with defecation block. A. Without strain. B. With strain, showing how a comparatively narrow section of contrast is being pressed downwards.

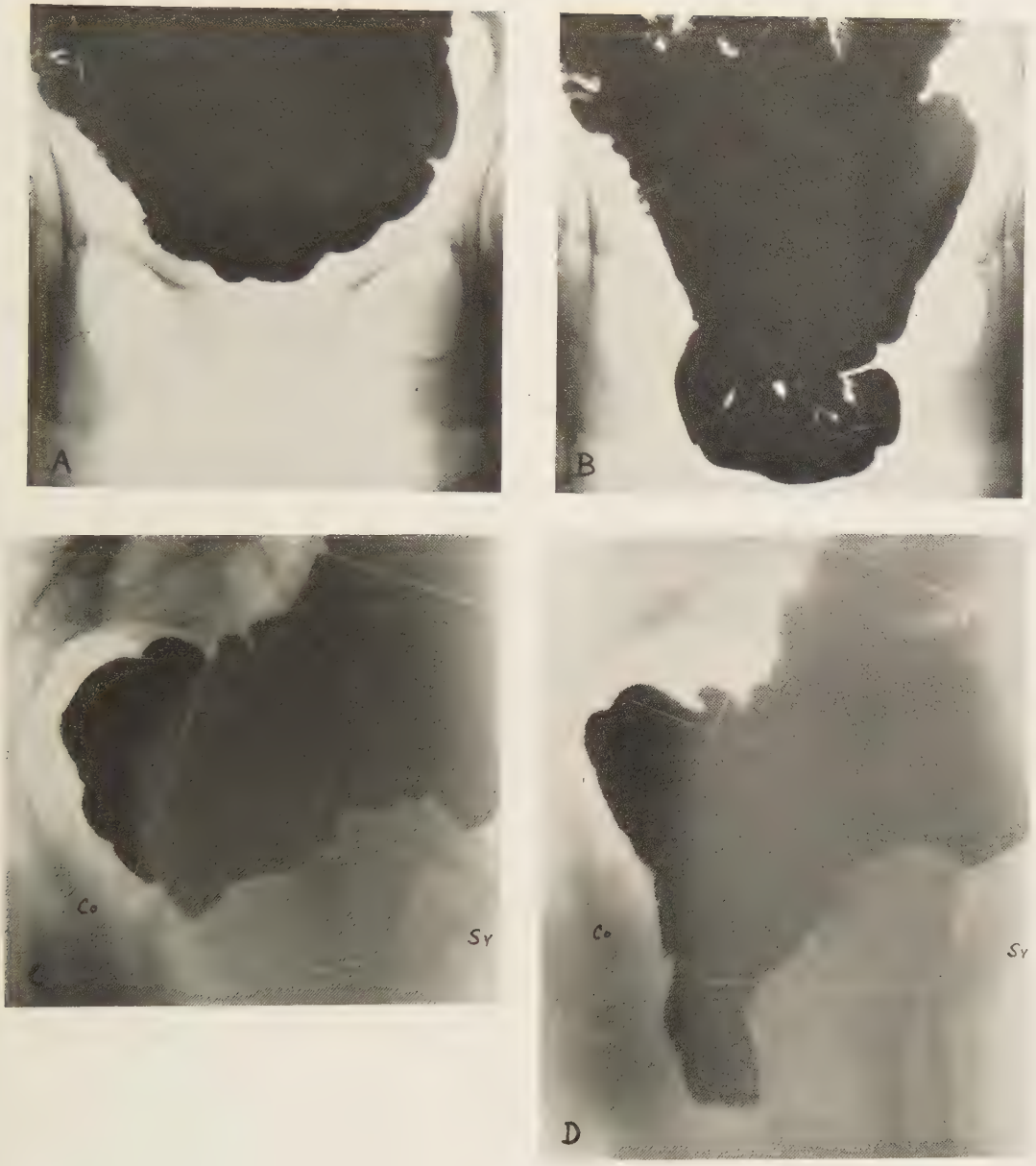

Fig. 39. Frontal and side views of the pelvis, with contrast in the small bowel, of a woman aged 25 with defecation block. A and C: without strain. B and D: with strain, showing a deep depression of a fairly narrow tongue of contrast in the dorsal part of the pelvis.

Fig. 40. Side views, with contrast in the small bowel, of a woman aged 40 with defecation block. A. Without strain. B. With strain, showing a downward bulge of a rather broader contrast area.

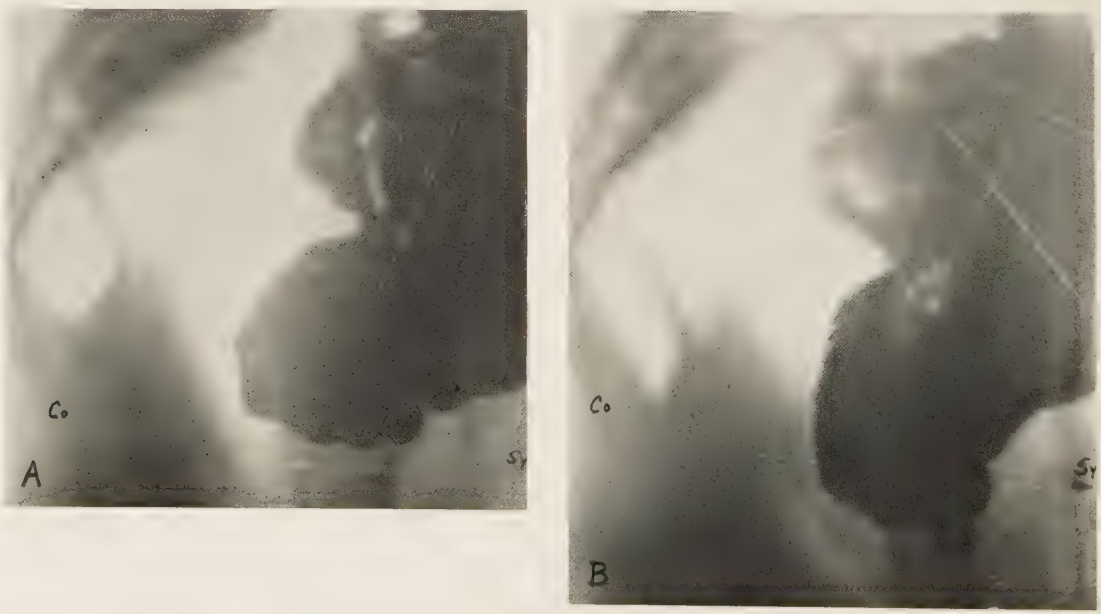

Fig. 41. Side views of the pelvis, with contrast in the small bowel, of a woman aged 45 with defecation block. A. Without strain. B. With strain. The contrast in both cases goes farthest caudad in the ventral part of the pelvis.

Fig. 42. Frontal view of the pelvis, with contrast in the small bowel, of a man aged 65 with defecation block. Though the patient was not straining the depth of the small bowel is considerable (cf. Fig. 24 A).

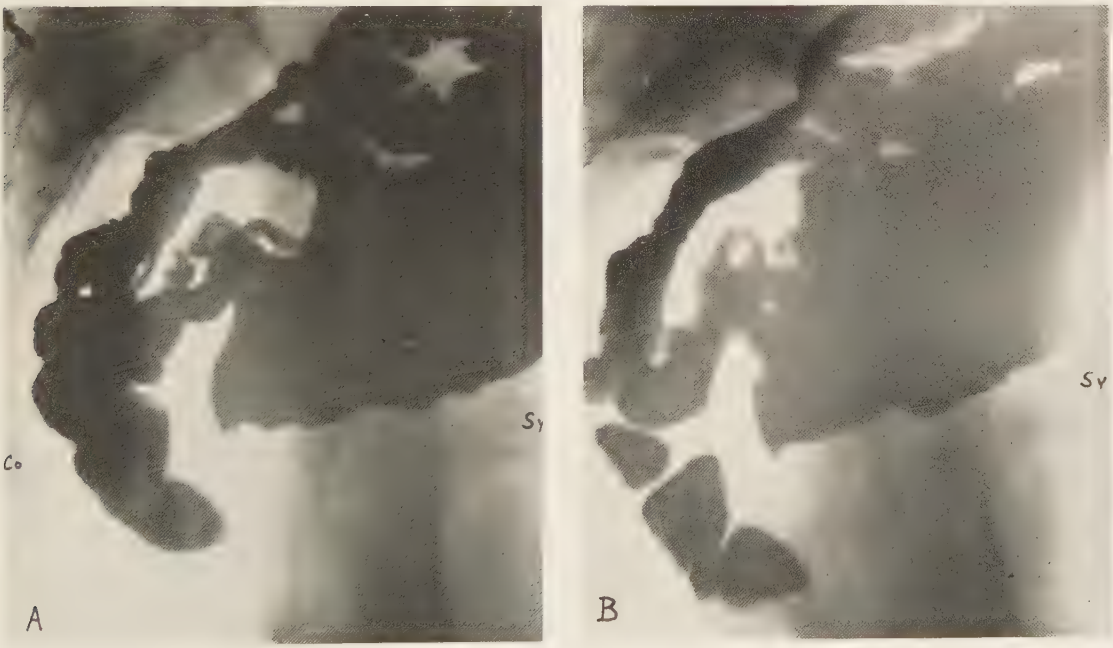

Fig. 43. Side views of the pelvis, with contrast in the small bowel, of a woman aged 73 with defecation block. A. Without strain, showing a considerable depth of the caudal contrast contour. B. With strain, when additional displacement caudad occurs.

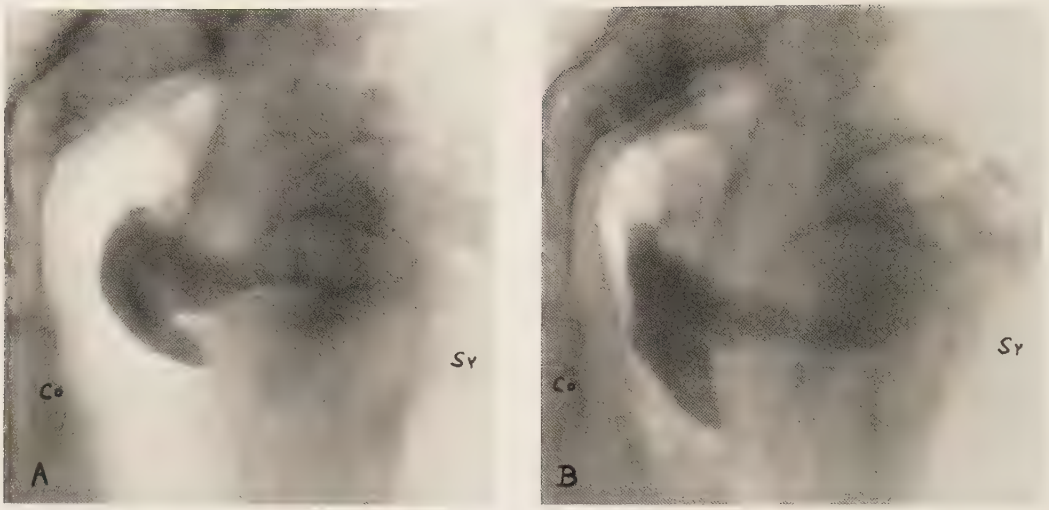

Fig. 44. Side views of the pelvis, with contrast in the peritoneal cavity, of a man aged 50 with defecation block. A and C: without strain. B and D: with strain, showing a caudad displacement of the rectogenital pouch.

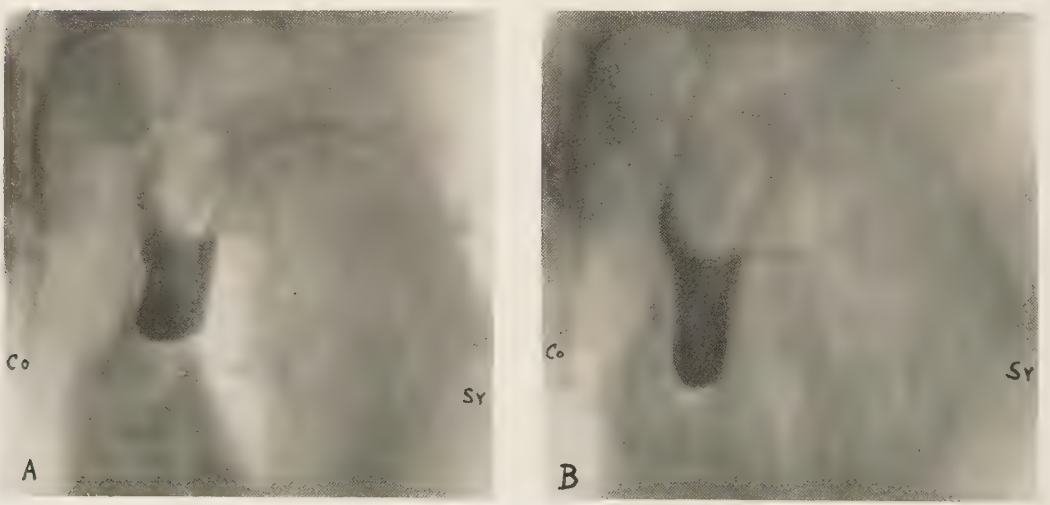

Fig. 45. Side views of the pelvis, with contrast in the peritoneal cavity, of a man aged 70 with defecation block. A. Without strain. B. With strain. Having a broad and rounded bottom, the rectogenital pouch is situated rather far ventrad.

Fig. 46. Side views of the pelvis, with contrast in the small bowel, of a woman aged 31 with defecation block. A. Without strain. B. With strain. The filling defect dorsally next to the sacrum represents the dorsocaudally dislocated uterus. (cf. Fig. 28).

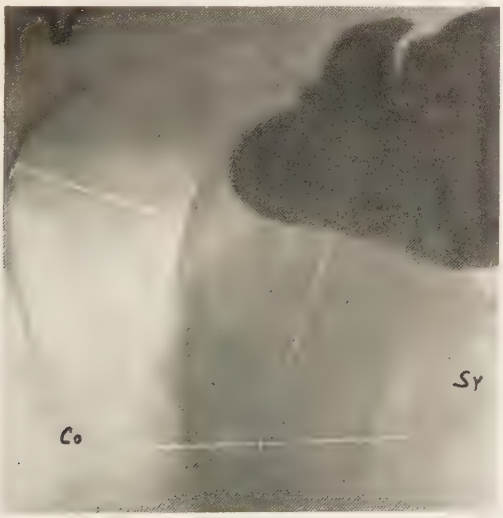

Fig. 47. Side view of the pelvis, with contrast in the small bowel, of a man aged 77 with rectal prolapse. The film was exposed with strain and with the prolapse outside the anus. The level of the caudal small bowel contour is unusually cranial.

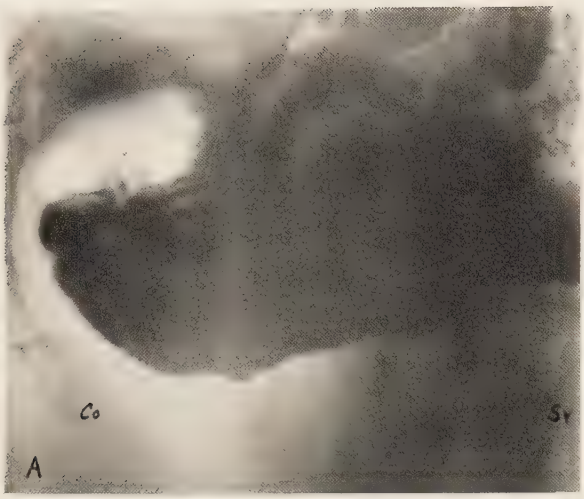

Fig. 48. Side views of the pelvis, with contrast in the small bowel, of a woman aged 27 with rectal prolapse. A without strain. B with strain, displaying a deep descent of the small bowel into the everted prolapse.

similar pattern is seen in Fig. 37 from a 43-year old woman (Case 17). At operation her rectogenital pouch was found to continue caudad as an egg-sized pocket. Only one subject in the control group, a nullipara aged 25 years, had this pattern. Straining occasionally made the small bowel jut down like a tonge into the dorsal part of the pelvis, in extreme cases past the pelvic outlet. This is shown in Fig. 38 from a woman of 23 (Case 32) and in Fig. 39 from a woman of 25 (Case 12). The frontal view revealed that the caudal part of the latter rectogenital pouch was wider than its mouth. These findings had a palpatory counterpart in a tonge-shaped mass intruding into the rectovaginal wall to or through the pelvic floor. The corresponding phenomenon in men is a soft mass that by straining is forced past the dorsal aspect of the prostate down to or into the pelvic floor. In other cases the lateral projection of the caudad protrusion was more extensive and had a rounded contour (Fig. 40: Case 25). It will be seen that in such cases, too, the mouth of the pouch may be rather narrow. More complete filling of the ampulla recti was noted at rectal examination and, as in the illustrated case, the caudad protrusion could even open the anus when the patient was straining. The caudal margin of the small bowel was very occasionally deepest in the ventral part of the true pelvis (Fig. 41; Case 26). Only women had such a pattern: it is contingent upon the presence of an abnormally deep genitovesical pouch and also on a markedly retroposed or retroverted uterus. In some patients the rectogenital pouch was remarkably deep even when they were not straining, as is illustrated by Fig. 42 from a man aged 65 (Case 10) and Fig. 43 from a woman aged 73 (Case 42).

All abnormally deep rectogenital pouches are not filled with bowel. Probably some never have such contents. Others very likely contain bowel on and off. Hence the method cannot be applied to some cases of this abnormability. Any difference between the depth of the rectogenital pouch and the caudad extent of the small bowel contour can nevertheless be visualized by injecting water-soluble contrast medium through the ventral wall of the abdomen into the peritoneal cavity. This was done in a few cases where the subjective symptoms and the palpatory findings were not borne out by an abnormal roentgenographic descent of the small bowel. The result is shown by Figs. 44 and 45 (Cases 7 and 29). The rectogenital pouch was situated rather far ventrally in Fig. 45 because the rectum was displaced ventrad, as in prolapse of the rectum. Moreover, the bottom of the pouch was rounded and rather broad.

Dorsad dislocations of the uterus were sometimes manifest, either because the small bowel descended remarkably far in the ventral part of the true pelvis (Fig. 41; Case 26), or because of a dorsally situated filling defect resembling the uterus in shape (Fig. 46; Case 36). In such cases, however, diagnosis must be based on the combined patterns of the rectum and small bowel (cf. Fig. 28).

2. *Cases of Prolapse*

These roentgenograms, too, had a varying appearance. The films were too few to justify any conclusions concerning the variation, but a few examples may serve to illustrate some important dissimilarities.

When not straining the youngest patient (Case 44), who may be considered representative of a fairly uncomplicated condition, presented no abnormal roentgenological features whatsoever. During straining, however, the prolapse fell out and the shadow of the small bowel descended markedly, the bowel apparently entering the caudalmost part of the peritoneal cavity far below the pelvic outlet (Fig. 48). The picture was completely different in some of the older patients. The level of their small bowel in the true pelvis was normal or even rather cranial, when they were not straining. When they were straining the prolapse fell out in all its length and the rectum was dislocated ventrad owing to its high mesentery, but the small bowel retained its cranial level in the pelvis (Fig. 47).

Assumedly these very dissimilar patterns represent different stages in the development of a prolapse. The youngest patient's rectogenital pouch was still wide enough for the small bowel to be pressed out together with the prolapse. In the older patients peritoneal wrinkling and congestion together with rectal thickening and dislocation prevented bowel from entering the rectogenital pouch, which was probably even more constricted owing to the falling out of the prolapse.

Summary of the Author's Main Results

Though the foregoing perhaps conveys the impression that the observations varied within wide limits, certain consistent features emerge from a summary of the results.

The dominant finding at rectal palpation was the caudad intrusion of the ventral rectal wall which, though sometimes manifest without straining, was usually brought on, and always accentuated, by straining. In extreme cases it filled the ampulla recti down to the anorectal ring, and

the latter was occasionally even opened by the depressed rectal wall. Sometimes the fasciomuscular floor of the pelvis was palpably defective; but, like the frequent dorsad dislocations of the uterus, this may have been a secondary change.

At laparotomy the characteristic and dominating sign in all but two of the patients was the remarkable depth of the bottom of the rectogenital pouch, which was very apparent in extreme cases. There were many intermediate cases between this and what may be accepted as normal. However, the abnormal depth of the rectogenital pouch was not the sole characteristic feature in the examined series, because often the peritoneal cavity was remarkably wide. In such cases the latter was always filled with viscera descending from the abdominal and pelvic cavities. One manifestation of such widening is the smoothing out of the rectogenital folds and increased wrinkling of the pouch which was observed in many cases. A number of changes, which perhaps were secondary, accompanied the abnormal distention of the rectogenital pouch. Among these alterations were: caudad dislocation of the uterus and slackening of its supporting structures, a high mesentery on the rectum causing angulation of that viscus, and defects of the pelvic floor musculature. These findings also ranged from normal to very pathological. The peritoneal lining in the rectogenital pouch had a varying appearance, in extreme cases being profusely wrinkled and very movable. Such changes were usually most prominent in the caudal part of the pouch and their arrangement enabled the pouch to become even wider and deeper. Protrusions were observed in various directions from the caudal part of the rectogenital pouch. Some of these protrusions passed ventrad laterally of the prostate or vagina, others passed caudad ventrally of the anus or even into the anal canal.

Classification of the patients with regard to age and sex would yield groups too small for a quantitative evaluation of these factors. There nevertheless seemed to be a general trend for peritoneal wrinkling to be least prominent in young and most prominent in old patients. With regard to the appearance of the pelvic peritoneal cavity there was no fundamental difference between nulliparae, uniparae and multiparae. All these groups included women with a uterus normally situated and firm suspension organs as well as women with an uterus more or less dislocated dorsad into the deep pouch and more or less atrophic uteroinguinal ligaments.

Roentgen examination of the rectum disclosed normal conditions in most of the patients, but some had a defective pelvic floor and dislocation

of the caudal part of the rectum, and one had rectocele. The caudad movement of the pelvic floor during straining was visualized and, by mensuration on the roentgenograms, found to have a slightly higher mean value in the patients than in the controls.

The caudal extent in the true pelvis of the small bowel shadow in upright position is described and illustrated by examples of different patterns. Usually, and chiefly in the young patients, the small bowel descended into the caudal part of a deep rectogenital pouch only when the patient was straining. The pictures in several cases showed a mass of contrast which was broad caudally and had rather a narrow neck. Even when they were not straining some of the older patients' small bowel showed a very deep descent and straining gave rise to additional dislocation caudad. Roentgenographical mensuration revealed that the mean level of the caudal small bowel contour was located farther caudally with and without straining in the patients than in the controls, the differences being statistically significant.

The clinical findings in the cases of rectal prolapse agreed with earlier observations. The ventrad dislocation in the pelvic cavity of the rectum, following eversion of the prolapse, could be visualized roentgenographically. The caudal level of the small bowel contour varied on the roentgen films. In a young patient it went right down to the caudalmost part of the prolapse, but in a few older patients it remained unusually cranial within the pelvis. Such a difference is apparently associated with the variable picture of the prolapse cases at laparotomy. When, as in the youngest patient, the rectogenital pouch is deep and wide and has a smooth peritoneal lining, there is less opposition to caudad movement of the small bowel accompanying the falling out of the prolapse. But when the peritoneum and rectal wall are wrinkled and thick, as in the older patients, it may be more difficult for the small bowel to descend into the true pelvis.

CHAPTER 3

Pathogenesis in Deep Rectogenital Pouch

Data from the Literature

During the second month of embryonic life the coelom develops caudad beyond the orifices of the Wolffian ducts (KEIBEL, 1896), later even extending to the pelvic floor (ZUCKERKANDL, 1891; TRAEGER, 1897; TOBIN & BENJAMIN, 1945; UHLENHUTH *et al.*, 1948). In due course the bottom of the peritoneal cavity again rises craniad because, according to ZUCKERKANDL (1891), the ventral and dorsal walls of the rectogenital pouch gradually fuse. CUNÉO & VEAU (1899) maintained that from this fusion results DENONVILLIER's (1836) prostatoperineal aponeurosis, here called the rectogenital septum. BROMAN (1914) stated that such prenatal fusion may take place when immobile peritoneal surfaces are pressed together with some force for a prolonged period.

TOBIN & BENJAMIN (1945) and UHLENHUTH *et al.* (1948) systematically studied the relationships during prenatal life between the rectogenital pouch and the rectogenital septum. Based solely on male cases, the first report deals mainly with the first months of embryonic life. The second report treats of male and female cases during the last 4 months of fetal life exclusively. Both the investigating teams asserted that while the abdominal viscera are growing and changing position the caudal part of the rectogenital pouch becomes obliterated during the latter half of prenatal life, owing to constantly progressing fusion of the mesenthelial surfaces which at that time make up at least part of the substance of the rectogenital septum.

According to EBNER (1887) abnormal postnatal depth of the rectogenital pouch is due to a persisting embryonic stage of development which is manifested by absent or inhibited caudocraniad obliteration. ZUCKERKANDL (1891) supported this view by embryological observations. Noted also by later authors, the dependence on prenatal development received additional confirmation from the aforementioned papers by TOBIN & BENJAMIN and UHLENHUTH *et al.* The latter concerned themselves particularly with the relationship between the rectogenital septum and the peritoneum and with the configuration of the peritoneum along

the cicatricial line corresponding to the cranial margin of the septum. Among other things they found that when the rectogenital pouch is abnormally deep the rectogenital septum may be missing altogether, which they attributed to fetal non-obliteration.

It should be possible to find a deep rectogenital pouch in infants and children if that abnormality is congenital. A peritoneal cavity extending to the pelvic floor has been found in solitary newborns (Uhlenhuth *et al.*, 1948), and in infants a few cases of herniation through the pelvic floor have been described (Moschcowitz, 1918). In further support of the congenital theory have been proposed those cystic growths with or without communication with the peritoneal cavity which Ziegenspeck (1887) demonstrated subperitoneally between the rectum and urogenital organs. Zuckerkandl (1891) ascribed these formations to incomplete fetal obliteration, comparing them with funicular hydrocele in the processus vaginalis peritonaei. This assumption was confirmed by an observation by Fredet (1904), and similar findings with histological verifications have been made by Bertrand (1927), among others. Incomplete obliteration of and persistent diverticular herniation from the rectogenital pouch have been reported by Zuckerkandl, Bertrand, etc. According to some authors (Sweetser, 1919; Bertrand, 1927; Black, 1934; Wilensky & Kaufman, 1940; Meigs, 1947; etc.) herniation caudad may also take place from a rectogenital pouch of normal depth. Reportedly such hernias have a narrow, well marked opening centrally or off-centre in the bottom of the pouch.

In his monograph on perineal hernias Ebner (1887) maintained that not only is a congenitally persistent, deep rectogenital pouch a predisposing factor to the development of such hernias, it is decisive. Zuckerkandl (1891) expressed the same view in a fundamental paper on embryology and anatomy. He thought that an abnormally deep rectogenital pouch starts as a capillary space which, owing to extraneous factors arising later in life, dependent bowel gradually opens so that it is ultimately differentiated into various forms of hernia, according to individual anatomical conditions. Zuckerkandl supposed that a pelvis with a large outlet and a small angle of inclination would be a predisposing factor. Some authors have stated that constitutional weakness must be present, others that pelvic floor defects acquired during life are more important. For these hernias, just as for other types of abdominal hernia, an abnormal increase of the intra-abdominal pressure is considered a precipitating factor. The development of a hernia from the rectogenital pouch is usually slow, but sometimes it is formed suddenly, mostly follow-

ing extreme bodily exertion, e.g. after a fall from a height or the like (Moschcowitz, 1918, etc.).

Like many of his predecessors, Watson (1948) emphasized that only women have hernias through the pelvic floor ventrally of the perinaei profundus muscle, whereas either sex may have hernias dorsally of that muscle, the incidence in women being 5 times higher than in men. The latter type of hernia usually occurs between 40 and 60 years of age, seldom before 20. Many of the existing forms of hernia are perhaps due to the complex anatomy and physiology of the female pelvis, resulting in pelvic floor stress. Many types, however, occur both in nulliparae and multiparae (Bertrand, 1927; Dixon, 1942; etc.). It is interesting to note the frequent reports of coexisting rectocele and vaginal hernia. Weed & Tyrone (1950) stated further that in a large proportion of their 52 cases of vaginal enterocele there were signs of uterine prolapse.

That an abnormally deep rectogenital pouch predisposes to the development of true rectal prolapse is becoming the accepted view. As pointed out by Maes & Rives (1926) such abnormal depth is equivalent to "a condition which prevents backward angulation of the rectum at the level of the prostate, since the bowel is not fixed to the prostate capsule at all, and intraabdominal pressure is applied directly to the anal orifice, stretching it instead of closing it as should be the case. Again the anterior rectal wall may be pushed like an obturator through the anus". Moschcowitz (1912) likened the abnormality to a sliding hernia, pressure from the abdominal cavity pushing the bulge caudoventrad along the dorsal rectal wall and then again dorsad out through the anus. A good idea of the significance of age and sex should be had from Hughes' (1949) series from St. Mark's Hospital. Comprising 231 cases collected over a period of 17 years, it is to date the largest series studied by a uniform technique. Eighty-five per cent of the cases occurred in women, 40 per cent of whom were nulliparous. The incidence in men was highest during the 2nd and 3rd decades and in women after age 40.

Summary and Aims

To prenatal development can be traced one condition for deep rectogenital pouch during postnatal life. During the first half of intrauterine life, according to systematic investigations, the peritoneum gradually gets down to the pelvic floor. During the second half of intrauterine life the bottom of the rectogenital pouch moves craniad, the ventral and dorsal walls of its caudal part uniting slowly by fusion. An abnormally deep

rectogenital pouch in adults was at an early time attributed to persistence of an embryonic stage of development and declared the most important predisposing factor for hernias and other peritoneal bulges in the region of the pelvic floor.

By personal observations during the mid-period of fetal life the author now intends to study the obliteration of the caudal part of the rectogenital pouch, paying attention to any pathogenetically important factors that may then set in. Relevant signs of congenital inhibitory malformations will also be looked for in the clinical material. Factors presumed to predispose to various clinical manifestations of a deep rectogenital pouch will, finally, be analyzed in the light of personal observations and of data from the literature.

The Author's Observations

A. Some Embryological Data

The object of the investigation was to study the association between the rectogenital pouch and the rectogenital septum during the mid-period of intrauterine life, when the obliteration described by earlier authors commences. A detailed account of the observations will be found elsewhere. Here it will suffice to mention a few points which may have pathogenetic significance.

1. Materials. The series, to date the largest one studied consistently, comprised fetuses from the mid-period of intrauterine life, their distribution being given in Table 14. The fetuses came from spontaneous or induced abortions. The fetuses were fixed in formalin before their overall length was measured according to accepted principles.

2. Methods. After being kept in 10 per cent formalin for varying lengths of time, the fetuses were divided at the median plane of the pelvic region. The incision passed through the centre of the anus and the midlines of the symphysis and anal cleft. The sectional surface of one, usually the left, of the hemipelvises thus obtained was photographed in natural proportions. Disturbing reflections were avoided by photographing the specimens under water. From both hemipelvises was excised for microscopical inspection the part containing the rectogenital septum and pouch with adjacent sections of the bowel, urogenital organs and pelvic floor.

Having been decalcified in a solution containing a mixture of formic acid and sodium formiate, the excised pieces were embedded in paraffin. Parallel sections 10 microns thick were cut commencing from the median plane, every 25th being saved and stained in hematoxylin-eosin.

3. Relations of the Rectogenital Pouch to the Pelvic Organs. During the 4th fetal month the peritoneum, as was known previously, extends far

Figs. 49—62. Photographic reproductions of sagital sections through the pelvis of fetuses from the midperiod of embryonic life. The arrow points to the bottom of the rectogenital pouch. R = Rectum, U = Uterus, V = Vagina, P = Prostate, B = Bladder, S = Rectogenital septum, PC = Peritoneal cavity, DD = Ductus deferens.

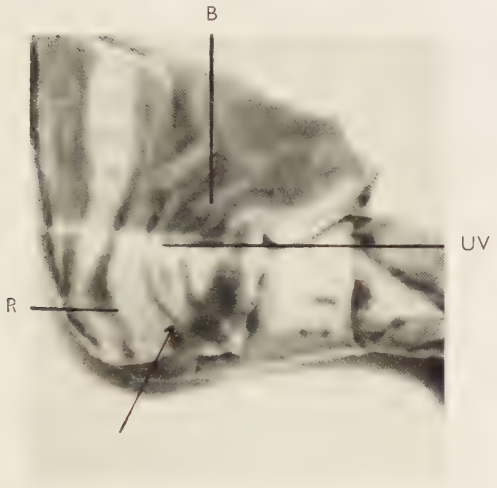

Fig. 49. Female fetus, 160 mm. The rectogenital pouch reaches the pelvic floor. The rectum contains no meconium. There is no rectogenital septum (× 2).

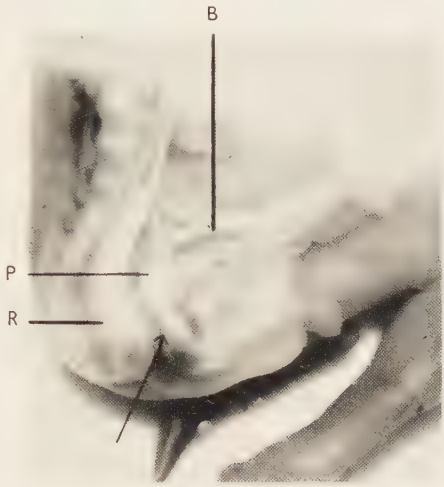

Fig. 50. Male fetus, 172 mm. The rectogenital pouch extends caudally beyond the prostate towards the pelvic floor. The rectum contains no meconium. There is no rectogenital septum (× 2).

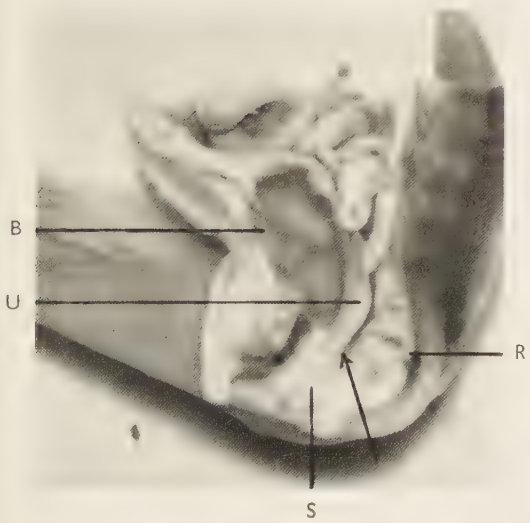

Fig. 51. Female fetus, 189 mm. The rectogenital pouch reaches about half way down the dorsal aspect of the vagina. The rectum contains a negligible amount of meconium. The rectogenital septum is developing (× 2).

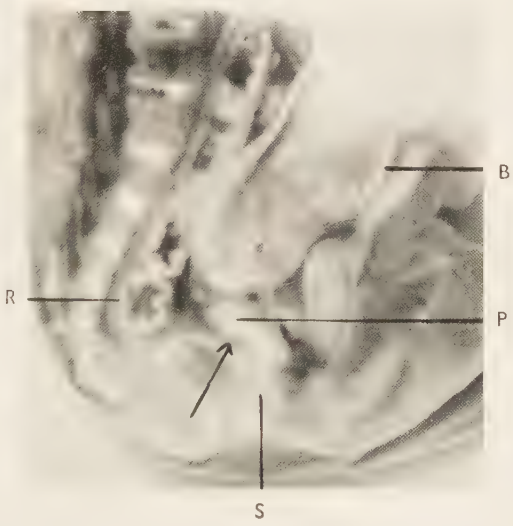

Fig. 52. Male fetus, 267 mm. The rectogenital pouch extends caudad approximately to the tip of the prostate. The rectum contains a negligible amount of meconium. There is a vestigial rectogenital septum (× 2).

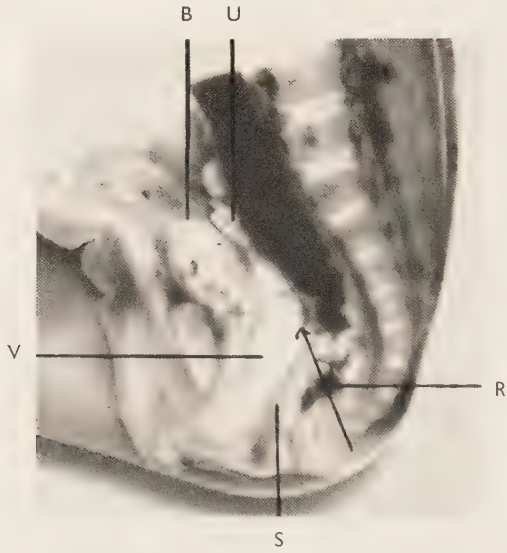

Fig. 53. Female fetus, 240 mm. The rectogenital pouch extends caudad just beyond the vaginal portion. The caudal part of the rectum contains a moderate amount of meconium. A tall rectogenital septum has already developed (× 2).

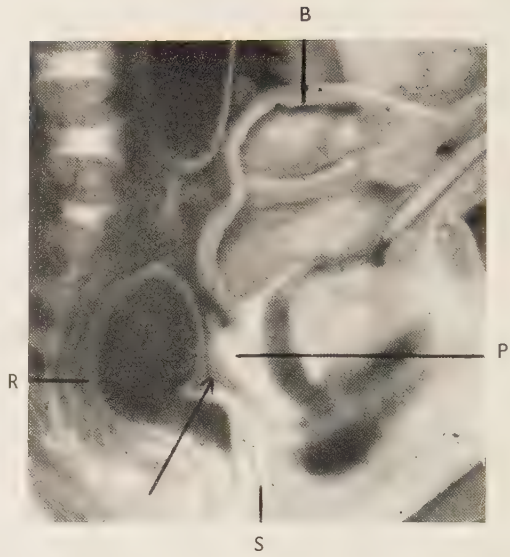

Fig. 54. Male fetus 287 mm. The rectogenital pouch extends caudad approximately to the tip of the prostate. The caudal part of the rectum contains a fair amount of meconium. In the cranial part of the rectogenital septum the dorsal and ventral walls of the rectogenital pouch have not yet fused completely (× 2).

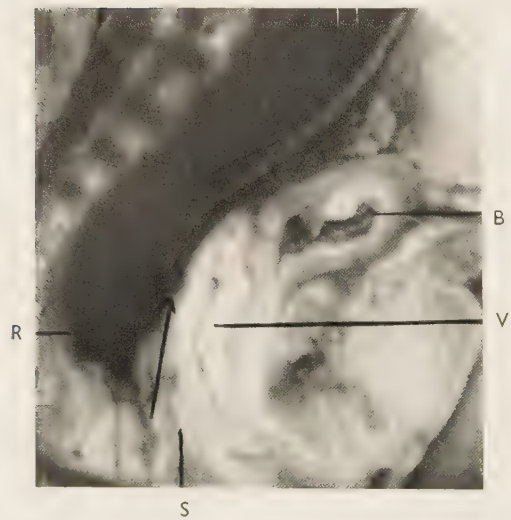

Fig. 55. Female fetus, 215 mm. The rectogenital pouch barely passes the cranial end of the vagina. The caudal part of the rectum contains a considerable amount of meconium. A tall rectogenital septum has developed (× 2).

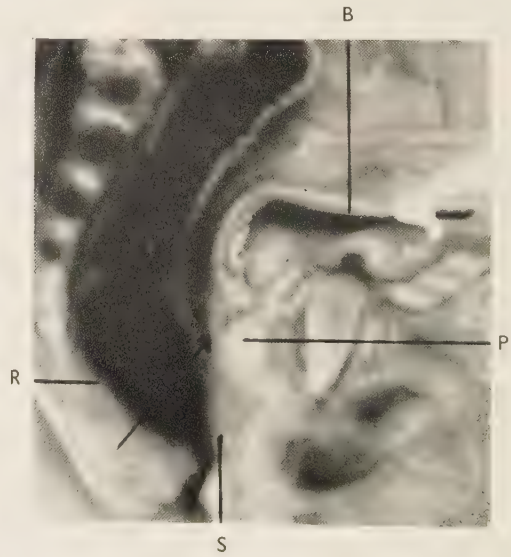

Fig. 56. Male fetus, 315 mm. The rectogenital pouch extends caudad to the cranial margin of the prostate. The caudal part of the rectum contains a considerable amount of meconium. A tall rectogenital septum has developed (× 2).

Fig. 57. Photomicrograph from a 162 mm female fetus, slide No. 9, demonstrating a small cystic space (*) caudally of the peritoneum (× 5.2).

Fig. 58. Photomicrograph from a 206 mm female fetus, slide No. 8, demonstrating a cystic configuation (*) of the caudalmost part of the rectogenital pouch and a narrow offshoot to the rest of the peritoneal cavity (× 5.2).

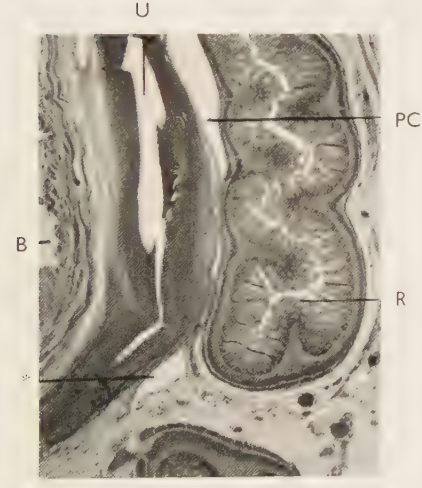

Fig. 59. Photomicrograph from a 214 mm female fetus, slide No. 5, demonstrating a cystic configuration (*) of the caudalmost part of the rectogenital pouch and a narrow offshoot to the rest of the peritoneal cavity (× 5.2).

Fig. 60. Photomicrograph from a 287 mm male fetus, slide No. 14, demonstrating the transition to rectogenital septum from peritoneum in the rectogenital pouch (× 5.2).

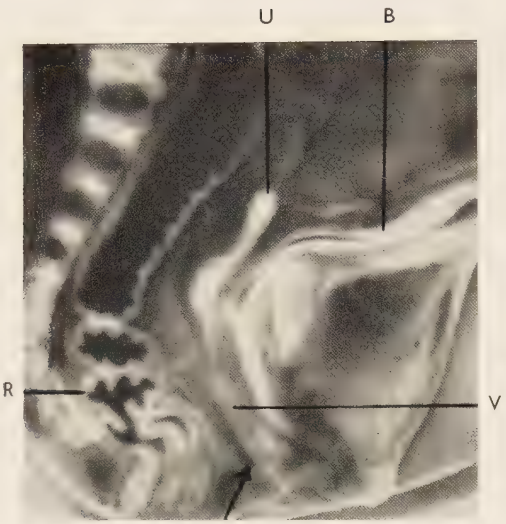

Fig. 61. Female fetus, 278 mm. The rectogenital pouch extends to the pelvic floor. The caudal part of the rectum contains a negligible amount of meconium. The bladder is collapsed. There is no rectogenital septum (× 2).

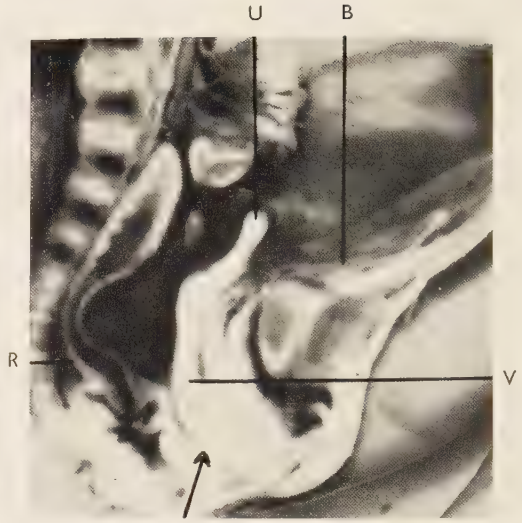

Fig. 62. Female fetus, 253 mm. The rectogenital pouch has a fissuriform portion reaching the pelvic floor, while the dorsoventral width of its cranial part is considerable. The caudal part of the rectum contains a negligible amount of meconium. The bladder is totally collapsed. There is no rectogenital septum (× 2).

TABLE 14.

Distribution of Embryological Series.

Group	Length in mm	Male	Female	Total
I	100—150	7	6	13
II	151—200	16	12	28
III	201—250	2	6	8
IV	251—300	7	3	10
V	301—350	2	2	4
	Total	34	29	63

caudad towards the pelvic floor, wholly coating the dorsal aspects of the prostate and vagina (Figs 49 and 50). The bottom of the rectogenital pouch later rises craniad, at the same time as the rectogenital septum is formed (Figs. 51—56 and 60).

The process is apparently accompanied by certain topographical changes in the pelvic cavity, which can be analyzed by measuring on photographs of the macroscopic specimens. Since it was considered valuable to apply the same principle throughout the series, the distance from the bottom of the bladder to the anus was the only one measured. The bottom of the bladder on the whole seems to lie at the same level as the cranial margin of the prostate or the vaginal portion.

A line through the centre of the straight spine and another parallel to it through the caudalmost point at the bottom of the bladder were used as base lines for the measurements (Fig. 63). From the projection of the anus on the latter line the distance was measured to the bottom of the bladder. The size of the bony pelvis was expressed in terms of the median outlet diameter from the tip of the coccyx to the caudal rim of the symphysis and of the sagittal depth of the pelvic canal from the dorsal aspect of the symphysis to the dorsalmost point on the sacral curve. Four degrees of rectal fulness were recognized. Fig. 64 shows the measurements obtained in graphical form.

Although the method adopted suffers from certain drawbacks and the small groups warrant no statistical evaluations, some points have at least hypothetical interest. The distance from the bottom of the bladder to the anus, the length of the median outlet diameter and the sagittal depth of the true pelvis all increase as the fetus develops. But the rate of growth of the skeletal measurements seems slightly lower than that of the distance between the bottom of the bladder and the anus, the

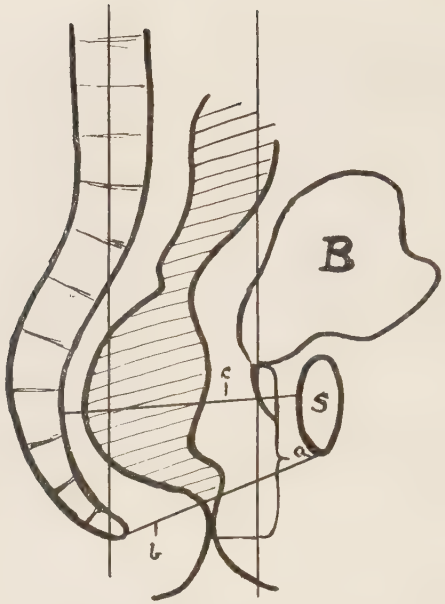

Fig. 63. Diagram showing measurements taken in the median sections through the pelvis. B = Bladder, S = Symphysis, a = the distance between the bottom of the bladder and the anus, b = the median diameter of the pelvic outlet, c = the sagittal depth of the pelvic canal.

latter distance increasing as fast as, if not faster than, the total length of the fetus. Concurrently the ampulla recti becomes increasingly full. Suppose now that the median diameter of the pelvic outlet and the sagittal depth of the pelvic canal designate the size of the bony pelvis, and the distance from the bottom of the bladder to the anus the size of the pelvic urogenital organs, then the rates of growth of the bony pelvis and of the pelvic urogenital organs seem to have changed during the second half of the period studied. Manifestation of the same thing is the tendency of the latter organs to project farther into the abdominal cavity as time passes. Another factor competing for space in the true pelvis is the increasing meconium content of the ampulla recti.

By microscopical inspection of the histological specimens a better conception may be had of the dorsoventral constriction of the pouch. In several cases small cystic spaces were found caudally of the peritoneum (Fig. 57). Occasionally these spaces communicated via almost invisible ducts with the rectogenital pouch, the caudal part of which often formed a narrow fissuriform space between the rectum and the urogenital organs (Figs. 58 and 59).

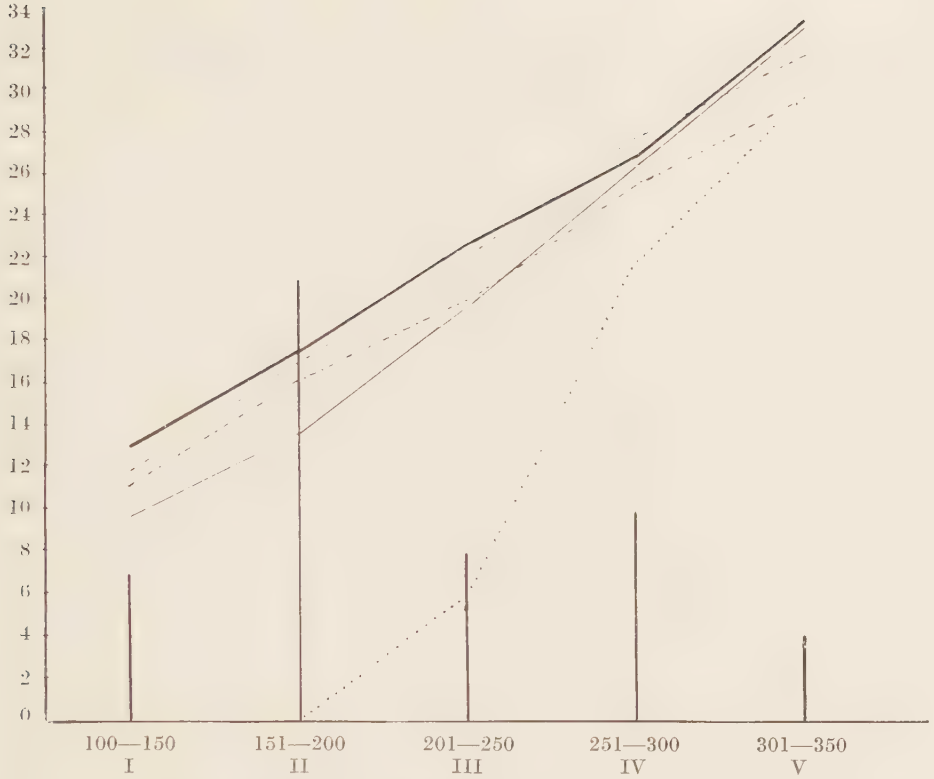

Fig. 64. Graphic representation of the results of measuring in median sections through the pelvis of 50 fetuses. The series was divided into 5 groups according to the length of the fetuses. | number of cases in each group, — $\frac{\text{total fetal length}}{10}$, —— 2 × distance from the bottom of the bladder to the anus, – – – – 2 × sagittal depth of the pelvic canal, · — · — · — · 2 × median outlet diameter, · · · · · 10 × degree of meconium filling of the rectum.

Though the obliterating process as such is probably regulated by factors yet unknown, the space-restricting effect of changes in the pelvic organs may well have considerable predisposing significance.

4. Pathogenetically Noteworthy Deviations. The series contained a few examples of deviating relationships between the rectogenital pouch and the rectogenital septum. Fig. 61 shows a 278 mm female fetus whose rectogenital pouch reached the pelvic floor, the dorsal aspect of the vagina being completely invested by peritoneum. The dorsoventral width of the pouch was also greater than normal, but the rectum was only slightly filled and the bladder wholly collapsed. Fig. 62 illustrates a 253 mm female fetus with a very wide rectogenital pouch, a collapsed rectum and a

completely flattened bladder. It is interesting to note that the deviant extent of the rectogenital pouch was accompanied by other spatial changes in the true pelvis in both these cases.

B. Clinical Indications of Congenital Rectogenital Pouch Malformations

The congenital theory might apply to some subjects in the clinical series. A 22-year-old male patient with defecation block (Case 1; Fig. 36) thus displayed clinical and roentgenological signs conforming with the theory of incomplete obliteration. A cranially well marked, narrow, peritoneal pocket reached the pelvic floor. A similar picture was presented by a single roentgenological control, a nullipara aged 25 years. Particularly interesting were two nulliparae of about 25 years (Cases 12 and 32) whose small bowel during straining descended, clinically and roentgenologically, deeply into the soft tissues between the anus and the caudal orifice of the vagina. At the same time the position of the uterus in the pelvis remained normal and the firm dorsal wall of the vagina did not bulge inwards. Signs suggesting incomplete obliteration were also seen in the youngest patient with defecation block, a woman operated on at age 17. In the prolapse group, finally, there was a woman (Fig. 48) whose rectal eversion at the age of 10—11 years was almost as big as when she was operated on at age 27. Here the clinical and roentgenological findings as well as the operative observations seem to agree best with the theory that the prolapse was due to a congenitally deep rectogenital pouch.

C. Prerequisites for Various Clinical Manifestations

Both the patients with defecation block and those with rectal prolapse displayed a low sex proportion, the women being in preponderance. The percentage of men in the defecation block series was only 27.5 and in the prolapse series only 25. The first figures deviates significantly from the normal sex distribution. It is doubtful, however, whether the defecation block series can be considered representative, since it so happens that it was assembled chiefly at an out-patient clinic for women. We must therefore remain content with the surmise that women have a greater propensity for defecation block in deep rectogenital pouch, though the present series does not prove this. The preponderance of women in the prolapse series fits in well with previous experiences.

Continued development of a clinically manifest abnormality might be affected by the degree of obliteration. Two of the patients in the series

may serve as examples of signs of a partial inhibition. The youngest man had a narrow but deep rectogenital pouch with a distinct cranial opening. One of the female patients had a peritoneal cavity of similar appearance. Several authors have remarked that the hernial sac of the type protruding towards the vagina is often thus elongated and comes out through a circumscribed opening between the rectogenital folds at the level of the dorsal vaginal fornix. It must be assumed that the rectogenital septum in such cases is only partially defective and therefore retains at least some of its supporting and fixing functions for the ventral wall of the rectum. Also the dorsal vaginal wall should then be relatively protected. But here comes into play a factor repeatedly discussed in gynecological works. Vaginal hernias are not seldom associated with various degrees of uterine prolapse and rectocele which probably influence the direction of the penetrating peritoneal protrusion.

None of the 29 women, 15 of whom were nulliparous, in the defecation block series had vaginal hernia. And the aforementioned partial inhibition was suggested by the configuration of the hernial opening and of the rectogenital pouch in but one of the surgical patients. Though many persons' uterus was more or less retroverted or retroposed, none had uterine prolapse. The rectal prolapse group, however, included two patients previously operated on for prolapse of the uterus. The high incidence in this series of uterine retroposition and retroversion may have been due to the fact that the uterus, particularly during straining, easily lodged between the depressed small bowel and the deep bottom of the peritoneal cavity.

When the rectogenital pouch is abnormally wide right down to the deep bottom, as in most of the author's patients, the rectogenital septum will provide no support for the ventral rectal wall which, therefore, will be accessible to protrusions from the peritoneal cavity.

There was no manifest hernia through the pelvic floor in the defecation block series. All the cases should consequnetly come under the heading proposed by Ebner and by Zuckerkandl, i. e. hernia imperfecta. In a number of cases, however, certain features justified their being regarded as forms transitional to manifest hernia. The depressions next to the anal canal in many cases, one from the prolapse group, presupposed changes in the pelvic floor musculature that would at least make them latent hernias. At the bottom of the deep rectogenital pouch the peritoneum, though smooth elsewhere, was in some cases profusely wrinkled, the pleats being concentrically arranged. In two nulliparae this additional protrusion clearly extended ventrally of the anal canal in the region of

the perineal body. These cases might consequently be regarded as hernias through the pelvic floor but, if so, of the type BARRET called enterocele or cul-do-cele. Had a male patient's sphincter been patent, the profusely wrinkled bottom of his peritoneal sac might easily have been pressed through it caudad, together with the ventral wall of the rectum. When a woman was straining, the caudal bulge in the rectal wall opened her anus and became visible from outside. Evidently both these cases were forms transitional to true rectal prolapse.

These observations may be briefly summed up as follows. A deep rectogenital pouch was occasionally associated with muscular defects in the pelvic floor which made caudad protrusions possible, and, in women, it was often accompanied by retroversion or retroposition of the uterus, but never presenting as vaginal hernia or uterine prolapse. The low position of the bottom of the peritoneal cavity was the common factor, depriving the ventral rectal wall of its normal support from the rectogenital septum and therefore leaving an area of reduced resistance open to the action of intraabdominal pressure.

From the conditions prevailing at any time it is difficult to draw conclusions concerning predisposing factors with regard to the degree of intrusion into the rectum and to the prerequisites for the extreme form manifesting itself as rectal prolapse. It seems likely that a rectogenital pouch that is very deep initially predisposes to early onset of symptoms of defecation block or rectal prolapse, and that a less extreme depth makes manifestation of symptoms a lengthier process and perhaps also requires greater secondary weakening of the pelvic floor and other organs for rectal suspension. This view is confirmed by the fact that the youngest patient even at an age of 10 –11 years presented a typical picture, although examination and operation 15 years later disclosed no changes in the organs or floor of the pelvis, apart from a very deep rectogenital pouch and a fairly high rectal mesentery. The other patients were older when the prolapse first fell out. At rectal exploration and operation they displayed besides the central feature—the abnormally deep rectogenital pouch—changes in the rectum, peritoneum, pelvic organs and pelvic floor, despite the short time of manifest prolapse. This applies to some extent also to the patients with defecation block. The picture was fairly clear in the younger patients, abnormal depth being the prominent feature, whereas the older patients had advanced secondary changes as well. The roentgenograms also revealed this difference between young and old, mainly with regard to the supporting and fixing functions of the pelvic floor. When the younger defecation block patients were strain-

ing the caudal margin of the small bowel was depressed very far from its normal level at rest, but in the older patients its position at rest could be very low and only slightly affected by straining. The youngest prolapse patient's small bowel moved far caudad during straining, but in several of the older patients the caudal contour of the small bowel remained remarkably cranial even when the prolapse was outside the anus. Secondary space-restricting abnormalities evidently interfered with the descent of the small bowel into the pelvic peritoneal cavity in the latter cases.

At an early date it was thought that the shape and position of the bony pelvis might have something to do with herniation from a deep rectogenital pouch. It was suggested that a small angle of inclination combined with a large outlet had a predisposing effect. The matter can be illustrated by some roentgenological observations. Supposing the angle of inclination is an index of pelvic position, then the controls agreed well with the patients with defecation block, but the patients with prolapse consistently had a smaller angle of inclination. With regard to the median diameter of the pelvic outlet, similarly, the defecation block patients agreed well with the controls while the patients with prolapse consistently had a longer diameter. Although it is thus reasonable to suppose that the development of true rectal prolapse from a deep rectogenital pouch intruding into the rectum is promoted by pelvic peculiarities, it seems at present impossible to determine what is predisposing and what is merely intercurrent or secondary.

Summary of the Author's Main Findings

On the basis of a larger fetal series than that of any of his predecessors the author has confirmed earlier theories that the caudal part of the rectogenital pouch is progressively obliterated, the rectogenital septum being formed in its place. This process is firmly associated with a concurrent dorsoventral diminution of the rectogenital pouch following relative enlargement of the pelvic organs and greater filling of the rectum. It is pathogenetically interesting to note that the rectogenital pouch was persistently deep and wide in two cases of remarkably slight rectal and vesical filling and, consequently, more space than usual in the true pelvis.

The roentgenological control series included a nullipara without defecation disorders whose rectogenital pouch had a narrow but very deep caudal offshoot. Similar pictures were also displayed by some young patients in the clinical series, palpatory and operative exploration giving

the impression that the abnormal depth of the pouch was due to congenital inhibitory malformations.

The degree of obliteration might, in the author's opinion, influence the development of various clinically manifest conditions. Some of the author's observations seem to bear this out. The deep rectogenital pouch in certain patients penetrated into or through the pelvic floor, in one or two cases entering the anal canal, and it seems justified to regard such conditions as prestages to, respectively, manifest hernia and rectal prolapse.

Common to these cases was the deep position of the bottom of the peritoneal cavity, exposing the ventral wall of the rectum to the action of intra-abdominal pressure.

CHAPTER 4

Defecation Disorders in Deep Rectogenital Pouch

Review of the Literature

According to Ebner (1887), hernias through openings not preformed in the pelvic floor usually give rise to constipation. Considering the enormous size of many of the hernias described in the early literature, the associated evacuation disorder was probably for the most part mechanical in origin. Not seldom the picture was complicated by symptoms of strangulation.

The symptoms of a protrusion into the vagina from a deep rectogenital pouch are said usually to resemble those of rectocele, i.e. they are unspecific (Bueerman, 1932). Few of the histories published have reported any evacuation or micturition disorders. Weed & Tyrone (1950), however, stated that the main symptoms in their patients with vaginal enterocele "were referable to the rectum. These patients complained of fulness in the rectum, inability to defecate, fecal impaction and a feeling of incomplete emptying of the bowel. Symptoms referable to the bladder, on the other hand, were minimal, or of secondary importance." Colic pains and vomiting may occur in severe cases when the protrusion is taut and unrestorable.

A large proportion of a series of old case reports assembled by Ebner (1887) stated that protrusions from the rectogenital pouch into the rectum are invariably accompanied by constipation — a symptom without qualifications alleged to occur in all types of abdominal hernia. Mignon (1905) described a man with rectal obstruction due to bowel lodged in the deep rectogenital pouch (the condition was called intrarectal hernia). In fact, however, intercurrent tuberculous peritonitis was found at operation. On rectal hernia Watson (1948) in his monograph on hernias stated simply: "The tumor causes constipation and there is a difficulty in defecation. There is a dragging-down pain in the rectum."

Rankin, Bargen & Buie (1932) maintained that constipation is a prominent feature in rectal prolapse which they regarded as a sliding hernia from a deep rectogenital pouch. Without discussing such an as-

sociation, Miles (1944) summed up his views on defecation disorders in rectal prolapse and its prestage—the form not yet extruding through the anus—as follows: "There is usually a history that the straining at stool and the difficulty in obtaining a satisfactory evacuation of the contents of the rectum supervened in a subject whose bowels were in the habit of acting regularly and in whom only the occasional use of aperients was necessary. In a large proportion of cases the constipation began to make itself manifest immediately after the first pregnancy. The characteristic feature of the constipation in these cases is that, although an action of bowels be obtained by the daily use of aperients, the quantity of faeces voided is insufficient and that, after stool, a sensation of incomplete relief remains." Spiesman (1946) also delegated the form not extruding through the anus to the rectal prolapse group, describing the defecation disorder in the following terms: "Instead of pushing stool down by the mechanism of defecation the bowel wall is forced down instead, obstructing the passage of the stool."

The main features of the defecation disorder are set forth in the author's preliminary report on the results of examination and operation in his cases of deep rectogenital pouch (Wallden, 1948). The crucial point is that straining is accompanied by a feeling of rectal block which often prolongs and interferes with bowel evacuation, despite the fact that the urge to defecate and the consistency of the feces are usually normal. Another noteworthy feature is the ineffectiveness of all attempts at conservative therapy.

Snellman (1951) reported similar defecation troubles in a number of cases of rectal bulging, either ventrad as in rectocele or caudad into the pelvic floor round the anus. He attributed these conditions to a defective rectogenital septum and, at least in some cases, he also found signs of an abnormally deep rectogenital pouch. But the evacuation disorders were in his view due to the bulges in the rectum.

Summary and Aims

Judging by the literature the great majority of clinically manifest forms of deep rectogenital pouch are liable to be accompanied by bowel evacuation disorders. Some reports have moreover stressed the rectal location of the symptoms and their connection with the caudad displacement of the rectal wall during straining. However, giving precedence to anatomical observations and surgical therapy, such reports on the whole deal meagrely with these phenomena.

The author's series was assembled from patients complaining of rectally blocked bowel evacuation. By collating histories the object now is to seek some characteristic features that can be traced throughout the material.

The Author's Observations

A. Cases of Defecation Block

Neither the fecal consistency nor the interval between evacuations were responsible for the evacuation disorders in the patients with defecation block. The main factor was the sensation of rectal blocking which usually set in during straining. Sometimes the patient was quite clear about this, sometimes it emerged from the history, but even so the dominating role of the symptom was admitted by the patient. The disorder was described in various terms. Some generalized about an obstruction of the rectum during straining. Others said straining was accompanied by a feeling of something impeding or stopping the feces, as a flap or valve closing or a balloon expanding. Another lot felt something other than bowel contents sliding down or falling out. Yet others complained that things just locked. Often the block was felt immediately after evacuation of a small amount and disappeared when straining ceased only again to return when straining recommenced, usually after another small evacuation. In most cases this intermittency was manifest even when enema fluid or loose stools were evacuated. Once the blocking had set in, many patients had to wait quite a while before the bowels would move. Others apparently could defecate with interruptions at closely spaced intervals. The defecation urge was usually normal but sometimes very strong. Some patients had found it best to let such a strong urge result in an immediate evacuation without straining, but the majority seemed unable to practice this method. Bowel evacuation often required an inordinate time and therefore became irritating in the long run. A few patients had themselves temporarily removed the obstruction. Thus, by inserting a finger into the rectum two men had tried to push aside the obstruction in order to "widen the passage for the feces." A woman had learnt to push back through the anus what she mistakenly thought were hemorrhoids. The oldest woman had invented a similar method of unblocking the rectal orifice.

A large proportion of the subjects had previously been examined for their trouble, and the explanation given had often become fixed in the

patient's mind. The commonest diagnosis was chronic constipation. Sometimes anal fissure or sphincteric spasm were made responsible, sometimes hemorrhoids, occasionally avitaminosis, psychoneurosis or some other generalized ailment. Colitis was diagnosed once or twice. It is difficult to estimate the scope of the investigations made because they had often been carried out long ago and by different physicians. That the doctors consulted had usually formed their opinions on the basis of the patient's subjective complaints is nevertheless an impression difficult to escape. However, probably to rule out the presence of malignancies, the colon actually was roentgenographed in many cases. Suspecting the presence of some specific blocking agent in the rectum, the physician had called for a second opinion in a small number of cases.

Onset usually preceded examination by several years. Consequently it was difficult to obtain a clearcut description of the initial symptoms. Many of the patients had, as noted, convinced themselves they were suffering from constipation, usually implying a difficulty in defecating, with or without hard stools. Not a few patients, however, from the rectal location of the obstruction, had concluded that hemorrhoids or another anal disorder was the precipitating factor. Whether or not the condition is hereditary is difficult to judge. In the few cases when close relatives had defecation troubles the condition was almost unexceptionally known as "hard stools." But the fact remains that one patient's father and paternal aunt both had similar defecation disorders.

Although the considerable time that had often elapsed since onset tended to make the patients' estimates of time a bit erratic, they still served to give an approximate idea of the duration of the symptoms. Many patients had had defecation disorders since early childhood, or as long as they could remember. At least 23 patients had had symptoms for more than 5 years and at least 18 for more than 10 years. But in many patients the blocking sensation had obviously not been marked from the very onset. It had instead become progressively more noticeable. Indeed, in some cases it had only recently become pronounced enough to dominate the picture. In a male patient whose defecation had up to then been fully normal the symptom set in suddenly. A few days later he was examined but could give no plausible explanation. When the blocking sensation had persisted for 8 months he was operated on. A female patient's evacuation disorder of many years' duration had exacerbated sharply 3 -4 years previously following a severe physical exertion which, in addition, was accompanied by a twitch of intense abdominal pain. Some patients said they had to keep on straining un-

usually long and with great force. The symptoms of 8 women had commenced or grown worse in connection with pregnancy or parturition. In the latter patients, as in the others, upheavals in the ordinary way of life may have accentuated the disorder for longer or shorter periods and made it more refractory to those attempts at forming regular bowel habits that the patients had made on their own initiative or on the advice of a doctor. A female patient, a nurse, was fully aware that the evacuation disorder had set in at a time when regular defecations were rendered impossible by her working conditions; and it had later resisted all attempts at re-establishing regular bowel habits. The blocking sensation had on the contrary become progressively more intense.

Although most of the patients' evacuation disorders had become increasingly troublesome, many had noticed a definite periodicity, at least during the early phases of the disease. The later stages, however, were usually characterized by more constant symptoms which some patients found pronounced or even severe and a few insupportable.

At least a third of the patients said their feces were of normal consistency most of the time, and some even tended to have soft stools. But many complained of hard stools, sometimes in the form of small pellets. This applied particularly to those who had long intervals between evacuations. The opposite was the case in a young woman with intervals lasting up to 2 weeks. Then she usually had 3—4 loose stools followed by another long interval. Though the interval between evacuations often exceeded what is considered normal, it was seldom longer than 4—5 days. The bowels of some patients moved at a few days' interval, and quite a few had daily evacuations.

In view of most of the patients' ideas about the nature of their trouble, it was but a short step for them to fall back on various cathartics. And a large number of subjects had previously been given medical advice to that effect, the agent recommended probably depending on the pathogenetic views entertained by the doctor in question. Many such prescriptions naturally included advice on the importance of regular habits and the composition of diets. Many patients, moreover, by prolonged experimentation had arrived at the mode of life and the diet which gave them the least trouble. It is remarkable, nevertheless, how little the various measures taken influenced the defecation disorder. In a large proportion of the cases laxatives and enemata had no effect whatsoever. Laxatives had, admittedly, made the stools softer in those who had very long intervals between evacuations, but the blocking sensation usually remained—in some patients unchanged, in others reduced, and in a

small number it was considered absent when, and only when, the stools were very soft. Enemata on the whole produced similar results.

Abdominal symptoms of various kinds have been described. Quite a number of patients complained of feeling distended and of stomach ache, in certain cases in the form of attacks. In several patients the pain radiated down to the rectum or into one leg, particularly during straining. A few complained of a sensation of pelvic fulness or heaviness. Pain was as a rule localized to the lower part of the abdomen.

A number of general symptoms for which the patients blamed the defecation disorder were often quite dominant. Nausea and headache, dyspepsia and vomiting were frequently present. A few patients complained of lassitude and impaired capacity for work. Two men had rather severe mental irritation with anxiety syndrome.

Solitary patients displayed signs of other diseases. Thus, a woman had rather severe rheumatic symptoms and transient, probably allergic, facial edema. A few patients had symptoms suggestive of gastritis, and a recurrent duodenal ulcer had formerly been diagnosed in one subject.

B. Cases of Rectal Prolapse

The few patients with true rectal prolapse available for the present investigation had histories deviating but little from earlier experiences. The youngest was a nullipara of 27 whose prolapse had formed at age 10—11. The others were adults when they became aware of their condition and went unexamined until after age 40. As many as 5 patients were more than 60 years old. Some had been suffering for years, others had first noticed the prolapse only a few years earlier, and one underwent an operation merely 6 months after the prolapse had developed. In a man of 77 the condition had set in after heavy exertion 2 years prior to the examination. He admitted he had felt the prolapse falling out on one or two occasions in his youth when he was straining, but what type of prolapse that was could not be determined so many years later. Two patients were psychiatric cases with a tendency to compulsive straining. Two women who had born children had previously been operated on for prolapse of the uterus. No fewer than 4 women were nulliparous.

Hard stools with delayed bowel movements had troubled many patients for a long time, but some subjects usually had soft stools. The defecation disorders were dominated by the discomforts caused by the prolapsed bowel and by an urelieved feeling after evacuations, as though feces still remained in the rectum. Incontinence was another troublesome feature

in many cases. In the group with rectal prolapse it was difficult to form an opinion regarding the exact nature of the defecation disorder, because many patients were not queried until many years after the operation. It was equally hard to judge whether a pre-existent bowel evacuation disorder underwent any changes after the prolapse had developed. However, some patients had clearly not had any evacuation disorder before the prolapse developed, and after that there were no symptoms characteristic of defecation block. A mentally retarded and perhaps a bit unreliable woman thought she remembered that things locked when she was straining before the operation. A woman who was unable to remember any particular defecation trouble before the prolapse developed and who afterwards was mainly troubled by incontinence on the contrary felt there was some obstruction in the way of the stools during straining after the operation. Something seemed to hinder the feces even if they were soft. Another woman reported similar postoperative experiences. From time to time she noticed an obstruction to defecation and then she had to go to the toilet many times before evacuation was complete.

Summary of the Histories of the Author's Patients

The evacuation disorder was dominated by a feeling of defecation block, usually during straining. The patients expressed their feeling that the hindrance was situated in the rectum in varying but often striking terms. The intermittent character of the block had made bowel evacuation a very lengthy procedure and, in severe cases, the patient's capacity for work was impaired. Most of the patients had been suffering for several years, at first often periodically, later not seldom constantly and more severely. Constipation was the commonest prior diagnosis, but hard stools with delayed evacuation was not particularly characteristic of these cases. Laxatives had meagre effects. Some of the patients had manually pushed the hindrance out of the way and so made bowel evacuation easier.

The evacuation distress was of a different sort in the patients with rectal prolapse. Many of them had hard feces with delayed evacuation. The congested rectal wall aroused a feeling of incomplete emptying in some patients. On the other hand, defecation block had apparently not occurred in the histories of the patients with rectal prolapse prior to operation, but two patients complained of something getting in the way of the feces when they were straining after the operation.

CHAPTER 5

The Mechanism of Defecation Block

Data from the Literature on Defecation and Abdominal Press

Normal defecation results from an interplay under nervous control between the intestines and the pelvic floor, and from concomitant intra-abdominal pressure changes. Having only minor significance in some animals, the latter factor is of considerable importance in others, particularly in man. According to PARAMORE (1910, 1911) this has to do with structural differences in the vertebrate body. The varying architecture of the pelvic floor is a good example. Those muscles which correspond to pars pubica and pars ilica of the levator ani and to the coccygicus muscle in man are highly developed in carnivora and primates, but in ungulates the former two are absent. PARAMORE pointed out that ungulates avoid bodily attitudes that would raise the pressure inside the abdomen, so they have no need of a highly developed pelvic floor. To defecate they need not strain, and they can do so on the wing. Straining necessitates more or less the crouching position assumed by defecating carnivora and primates, and their pelvic floor is firm enough to withstand the ensuing increase of the intra-abdominal pressure.

From the peculiar bodily attitude and way of life of man has resulted a further development of the pelvic floor structure. This, as shown by KEITH (1923), is intimately associated with the structural change in the bony pelvis incidental to the transition from pronograde to orthograde life. Owing to the ventrad curvature of the sacrum and the stronger fixation of the coccygeal vertebrae the dorsal part of the pelvic outlet has become smaller and its margins firmer. Moreover, the sacrospinal ligaments—which are found in orthograde primates only—are developed much more heavily than they otherwise would have to be. But this dorsal strengthening is accompanied by a ventral weakening. The pubic angle is wider and faces caudoventrad on account of the changed inclination of the pelvis. As a result the levator is more horizontal and plays the part of a real floor to the pelvis.

The downward pressure on the pelvic floor has never been measured adequately. Measured rectally in immobile upright subjects (PARAMORE, 1911; KEITH, 1923; EISENMENGER, 1935; LECOURS, 1946; etc.), this pressure is only something like 15 –20 mm Hg. But it increases on the least motion, and is multiplied at ordinaly levels of activity. During defecatory straining it may attain 150—200 mm Hg.

The increase during defecation of the intra-abdominal pressure is in man largely voluntary. But under certain circumstances it may assume the character of a reflex. In decerebrate cats and dogs defecation results from interaction of intestinal motion and contraction of the abdominal wall, the animal assuming the position that its species characteristically assumes when defecating (GOLTZ, 1874; BARCLAY & FRANKLIN, 1937). In man an involuntary contraction of the abdominal wall and pelvic floor may occur

when the call to defecate is more than usually intense, e.g. when voiding is obstructed mechanically, or if there is no volition, such as in infants and certain mental defectives.

When mass peristalsis (Hurst, 1907; Holzknecht, 1909; Case, 1915), forces the contents of the colon past the constriction of the lumen at the rectosigmoideal juncture, there arises, according to Hurst (1919), the sensation of urgency which heralds the need to empty the bowel. Investigations by Denny-Brown & Robertson (1935), Gaston (1948) and Goligher & Hughes (1951) have demonstrated that the sensitivity to distention is rather small in the colon, much greater in the rectum, and increases by degrees as the anorectal ring is approached. When the rectum is distended its wall responds by contracting, more and more intensely as the distention moves caudad. Simultaneously the internal anal sphincter relaxes, but the external remains unaffected (Denny-Brown & Robertson, 1935) or even acquires a higher tone (Garry, 1933; Gaston, 1948; Goligher & Hughes, 1951).

If the voluntary control permits defecation, the abdominal press starts operating. Should rectal dilatation be increased thereby, a final reflex is precipitated (Hurst) which through contraction of the bowel walls leads to an evacuation, because (Denny-Brown & Robertson) the pelvic floor musculature and sphincters relax simultaneously. After ended bowel evacuation the sphincters and the levator ani contract, the puborectal part of the latter being chiefly responsible for the closure of the bowel at the anorectal ring which it also pulls cranioventrad towards the symphysis (Thompson, 1899; Milligan & Morgan, 1934).

Summary and Approach to the Problem

Human defecation is affected by the abdominal press. When the contents of the colon has been transferred by peristalsis to the rectum and evoked an urge to evacuate the bowel, straining contributes to the dilatation of the caudal part of the rectum which, in turn, precipitates the final defecation reflex. The latter generates a new wave of contractions in the walls of the colon and rectum, at the same time as it relaxes the anal sphincters and the pelvic floor musculature, and as a result the contents of the bowel are expressed.

The task before the author is to study the action of abdominal press on the rectum, both under normal conditions and in such anatomical abnormalities as characterized the patients with defecation block, and to discuss the significance of the findings for the mechanism of defecation.

The Author's Observations on the Blocking Mechanism

The study of the mechanical action of intra-abdominal pressure on the rectum is complicated by the functional variability of the abdominal cavity and its walls. Matters will be much simplified, however, if we consider separately certain fundamental physical conditions. Let us suppose,

as a working hypothesis, that the peritoneal cavity is a water-filled space with rigid walls. If the pressure in the cavity were raised, all the organs in it would be affected equally. Their positions, shapes and sizes would in other words remain the same. Suppose further that inside the cavity there is an intestine which is filled with plastic matter and communicates with the outside. Conceivably an increase in the pressure inside the cavity would now tend to express the contents of the intestine.

To study this mechanism the author has made experiments with some models. A cylindrical glass jar (Fig. 65), 28 cm high and 18 cm in diameter, was provided with a hole in the bottom, through which was passed a 26 cm long piece of bicycle inner tube 3 cm in diameter. A rubber bung with a hole through it was fitted into one end of the tube and then pressed into the hole in the bottom of the jar so that the tube was securely wedged between the two. The other end of the tube was closed with an ordinary cork. Soldered to the lid of the jar was a small metal tube with an afferent rubber hose. The bicycle tube was filled with rye porridge of such a consistency that it would not by itself escape through the lower opening. Connected via the afferent rubber tubing to a vertically movable water container, the lid was then screwed water tight on the jar which had been filled with water right up to the brim.

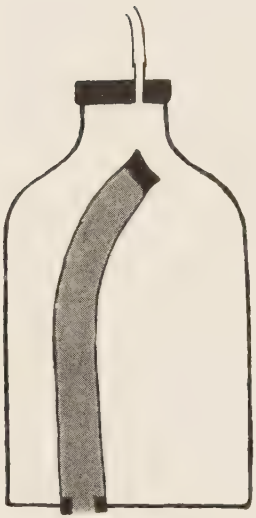

Fig. 65. Diagram of the author's model.

Merely filling the jar with water (Fig. 66 A) made some of the pasty contents of the rubber tube escape, and the tube was compressed slightly just above the bottom opening. Raising the pressure by about 100 cm of water gave rise to a rapid escape of a slightly greater amount of porridge and to complete collapse of the lower part of the tube so that the passage was blocked (Fig. 66 B).

Under normal conditions the greater part of the ampulla recti lies outside the peritoneal cavity and is, like other pelvic organs, more or less firmly surrounded by fasciae. When the rectogenital pouch is ab-

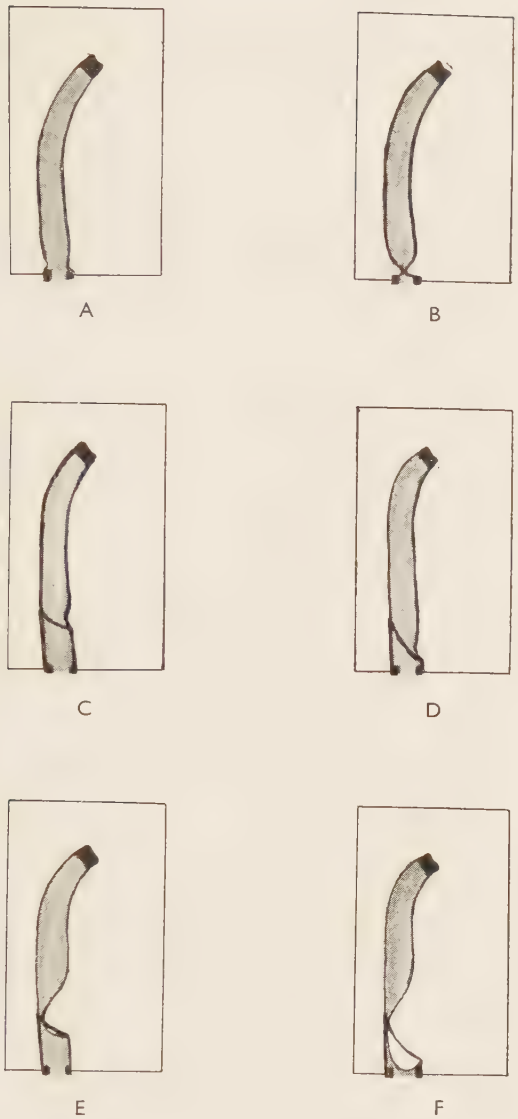

Fig. 66. Diagrams showing the experimental results. A. Filling the jar with water compresses the tube slightly immediately above the opening; B. The increased pressure in the jar makes the tube collapse completely immediately above the opening; C and D. Filling the jars with water causes slight compression of the tubes immediately above the lowest part of the sleeve rims; E and F. The increased pressure in the jars makes the tubes collapse completely just above the lowest point on the sleeve rims.

normally deep, on the other hand, most of the ventral wall of the ampulla recti lies inside the peritoneal cavity and is thus exposed to the action of intra-abdominal pressure. To study these various factors more experiments were devised.

In two jars of the above type the lower end of the bicycle tube was protected by a cylindrical metal sleeve which projected from the bottom of the jar and whose top end had been cut at an angle. Both sleeves had the same diameter and the same maximal height, 5.5 cm, but the minimal height of one was 4.0 cm and of the other 0.5 cm. This dissimilarity was intended to represent the aforementioned difference with regard to the support and fixation of the ampulla recti.

Filling the jars with water (Fig. 66 C and D) created a small impression in the bicycle tubes just above the metal sleeves, and a small amount of paste was expressed. Probably because of hydrostatic pressure differences, the impression in the tube was a bit smaller in the jar with the metal sleeve whose rim was more nearly horizontal. Raising the pressure in the jars by 100 cm of water made a slightly larger amount of rye compound escape rapidly, and the bicycle tubes were wholly compressed above the low side of the metal sleeves (Fig. 66 E and F). Now, too, the jars displayed a difference in degree. The compressed area was greater in the jar with the sleeve whose rim was more sloping, and the lowest part of the compression bulged more deeply into the sleeve.

The results of these simple experiments bear out other authors' findings, even if in their experiments the tube owing to other aims was filled with water or some more viscous fluid. The collapse phenomenon has been analyzed theoretically in other connections, e.g. in researches into the pressure conditions in veins piercing the sclera. The drop from the higher intraocular to the lower extrabulbar venous pressure is caused by a partial collapse of the vein near its exit. A rise in intraocular pressure makes the pressure difference greater and, consequently, the collapse more pronounced.

The tube in the above experiments obviously collapsed because the pressure inside it was reduced when some of its contents escaped. When the pressure in the jar was reduced to its initial value, the collapse was not reversed because the pressure in the tube was reduced by an equal amount. However great, a further rise in pressure would consequently not cause any additional material to be expressed. If the pressure exerted by the contents of the tube were somehow made to force the contents ever farther down irrespective of outside forces, the collapse would perhaps be less marked and vary in proportion to the water pressure. As

the contents passed the more or less collapsed part of the tube, various rheological factors, such as rate of flow, friction and resistance to plastic deformation, would then come into play. Thus, for example, the greater friction at the point of collapse would augment the pressure sideways, which would tend to counteract the collapse. The degree of collapse is determined by the state of equilibrium between these forces.

These facts seem to hold good in principle for all cases where the contents of a collapsible tube pass from one chamber to another with a lower pressure. It may be assumed with respect to the peritoneal cavity that an intra-abdominal pressure increase will create a collapse phenomenon wherever intestines or vessels pass out through the abdominal wall or into tissues or organs with a lower pressure.

These experimental results will not apply to the human rectum unless the anus is assumed patent. Whereas straining would normally produce a collapse immediately craniad of the ampulla recti, the same would perhaps take place very close to the pelvic floor if the rectogenital pouch were extremely deep. Although straining demonstrably exerts a pressure on the rectal contents high enough to open the sphincters, the fact remains, however, that sphincteric function is governed mainly by the reflexogenic interplay with the musculature of the rectal wall. Not until the latter contracts following dilatation, due to straining, of the caudal part of the rectum do the sphincters relax enough to permit normal evacuation, in which process contraction of the intestinal wall is the dominant factor.

The increase of intra-abdominal pressure during straining, to which contributes contraction of the pelvic floor musculature, has greater or lesser repercussions on the position of the pelvic floor. The diaphragm descends to its lowest inspiratory level and the musculature of the abdominal wall contracts, the transversus abdominis among others functioning as a compressing belt (Keith, 1923). Thereby the volume of that part of the abdominal cavity which lies cranially of the pelvic inlet is probably reduced, whereas the volume of the part inside the pelvic canal owing to depression of the pelvic floor would tend to increase rather than decrease. Hence the depression during straining of the pelvic floor is accompanied by caudad displacement of the contents of the abdominal cavity, the mutual positions of the viscera being determined by their and their contents' relative mobility. To the varying anatomical fixation of the organs by mesenteries and ligaments must be added the effects of viscosity, plasticity and friction. The main contenders for space in the pelvic peritoneal cavity are the small bowel and the rectal contents.

Since there ought to be much less friction and resistance to plastic deformation when the small bowel with its high mesentery moves about in the peritoneal cavity than when the contents of the sinuous and wrinkled rectum move caudad, displacement of the small bowel would seem to be the main result of straining. If the peritoneal cavity has an abnormal depth towards the pelvic floor, so that the small bowel is capable of moving that far caudad, it should be possible for the caudal part of the rectum to collapse even if the anus is closed (Fig. 67 A and B). That this actually is what happens in subjects with defecation block is demonstrated by the caudad bulge in the ventral rectal wall that during straining can be felt by digital exploration of the rectum. Several of the author's defecation block patients, however, had the type of bowel evacuation that was observed in the experiments: straining produced a small evacuation and only after that was there complete blocking. Caudal dilatation of the rectum—which is what precipitates the final defecation reflex—thus never occurs.

The defecation block in deep rectogenital pouch is probably in certain cases made more complete by anatomical peculiarities. When a wide and deep rectogenital pouch has a narrow mouth (cf. p. 52 and 53) the reposition of the bowels from their caudel position is impeded. This was in several cases observed at operation. At fluoroscopy in conjunction with the roentgenological examination it was noted from time to time that after the contrast-filled loops of small intestine had been pressed down by straining to the bottom of the pouch they only gradually, and in some cases incompletely, returned to their original position. In addition the attempts made by several patients to facilitate evacuation by manually clearing away the obstruction probably assisted in returning a bundle of bowel more or less enclosed in the caudal part of the rectogenital pouch to its original position. These factors probably become more important if the small bowel contains heavy matter (food, roentgen contrast medium).

In cases of deep rectogenital pouch another factor possibly contributes to the defecation disorder. The considerable bulge in the ventral wall of the rectum must obviously in some cases be traumatized. Signs of this were seen in extreme cases of defecation block and they were very prominent in the prolapse cases. Therefore it is not impossible that in this condition the sensibility and contractility of the rectal wall may so deviate from normal as to interfere with the mechanism of defecation. But even if this theory is applicable to some of the cases of defecation block no such trouble was seen in the prolapse cases—the mechanical effect of defecation strain on the rectum is probably the main factor at work.

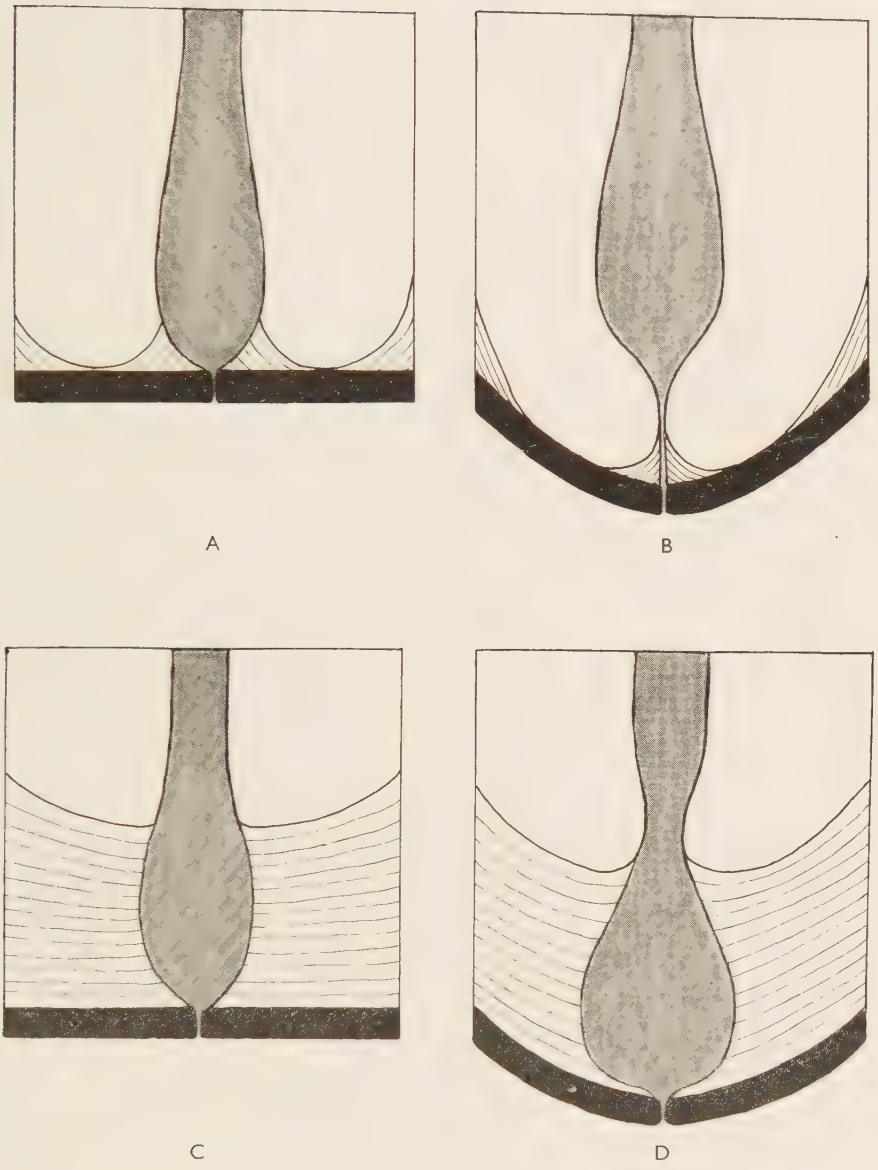

Fig. 67. Diagram of the author's hypothesis concerning the effect of intraabdominal pressure on the rectum. A. With and B. Without strain in extremely deep rectogenital pouch; C. With and D. Without strain in normally deep rectogenital pouch.

The conditions for collapse of the caudal part of the rectum are absent when the rectogenital pouch has a normal depth. Even then straining admittedly depresses the pelvic floor to some extent. However, any considerable displacement caudad of the contents of the pelvic peritoneal cavity is prevented by the supporting structures surrounding the ampulla recti, as may be determined by digital exploration of the rectum. Instead the tension in and resistance of these tissues give rise to a pressure gradient in caudal direction. The pressure on the sides of the rectum should consequently decrease as the pelvic floor is approached. Instead of collapsing the caudal part of the rectum, this tends to dilate the rectum and move its contents caudad (Fig. 67 C and D). This mechanism is probably instrumental in precipitating the final defecation reflex.

It is a remarkable fact and demands an explanation that in no case did the patients with prolapse of the rectum complain of or admit any knowledge about the above defecation disorder, despite being questioned specially on the subject. When the ultimate disease has features as remarkable as those of rectal prolapse it is quite possible that a bowel evacuation disorder in the early history might be suppressed, or even completely forgotten. But, if so, it is very improbable that the defecation disorder was prominent. At any rate such troubles are unknown in the symptomatology of manifest rectal prolapse, as evidenced by the author's subjects. It will be realized that this too is quite explicable. By peristalsis transferred from the colon to the rectum, the contents of the bowel will together with the prolapse be forced out through the anus by straining. The interplay between abdominal press and intestinal motion will consequently be free from conflict. It is quite another story that persons with rectal prolapse are often troubled by so-called constipation.

Summary of the Author's Views on the Blocking Mechanism

Model experiments illustrate some features of the physical effects on the rectum of straining. These experiments have borne out previous experiments along similar lines which have chiefly concerned the collapse of a compressible tube when its contents pass from one region to another where the pressure is lower. The collapse occurs close to the point where the tube leaves the region of high pressure, and the degree of the collapse is probably influenced by factors such as the pressure difference, rate of flow and friction.

In deep rectogenital pouch the pelvic floor and the contents of the pelvic peritoneal cavity often move quite far caudad during straining. Since

the ventral wall of the rectum in such cases is not supported by a rectogenital septum, it is exposed to the direct action of the abdominal press. As the caudad displacement of the small bowel in the peritoneal cavity is probably hampered less by friction and resistance to plastic deformation than are the contents of the rectum, conditions favourable for collapse of the ampulla recti will prevail during straining. In certain cases the collapse will probably be rendered more complete and persistent if the deep rectogenital pouch has a mouth so narrow that it constitutes a relative obstruction to a reposition of the small bowel to its original position after straining. The condition is then similar to a hernia which is difficult to restore. Anyhow, the caudal dilatation of the rectum, which would precipitate the final defecation reflex, will not take place.

When the rectogenital pouch has a normal depth the rectogenital septum and other fixing structures round the pelvic viscera probably bring about a progressive reduction of the increased intra-abdominal pressure as the pelvic floor is approached. Instead of a collapse the depression of the latter might consequently lead to a dilatation of the caudal part of the rectum, the simultaneous caudad movement of the rectal contents releasing the necessary final defecation reflex.

As in patients with prolapse of the rectum the rectal contents fall out through the anus together with the prolapse, these subjects will experience no symptoms of defecation block.

CHAPTER 6

Operative Therapy in Deep Rectogenital Pouch

Review of the Literature

Pathogenetical obscurity and, often, incomplete diagnostic data in early case reports make it hard to analyze the implications and effect of the operative procedures used. It will suffice to mention that, for example, Dickson Wright (1949) found in the literature more than 50 different methods for surgical treatment of rectal prolapse, many of them having a high primary mortality. He specified 36 methods that had been in fairly general use. This account will deal mainly with early reports on those operative methods which in principle resemble the present author's.

It should be mentioned in passing, however, that as a rule the various hernial protrusions through the pelvic floor from a deep rectogenital pouch were formerly approached from the caudal side of the pelvic floor, with excision of the hernial sac and plastic repair. of the pelvic floor. Chase (1922), reviewing the literature, found 13 operated cases of ventral hernia through the pelvic floor. He also published a case of his own which, he said, was the first without a relapse for 3 years. But he was the first to use a combined method by which excision from the abdominal cavity of the hernial sac preceded plastic surgery of the caudal muscles.

Previously the type protruding towards the vagina was in most cases also treated by caudal exposure and excision of the hernial sac and by plastic repair of the pelvic floor musculature. Among the 9 cases in the literature which, according to Miles (1926), met the criteria for vaginal hernia, 6 had been operated on —3 by the caudal route, 2 by the abdominal route and 1 by a combined technique. Only one of these cases, for which the caudal technique had been used, had been kept under observation long enough to be considered healed. At any rate it had not relapsed 2 years after the operation. In addition Miles published two cases of his own, one operated on caudally with excision of the hernial sac and plastic surgery of the musculature, the other with obliteration of the rectogenital pouch via the abdominal route. He gave no information concerning the outcome in these cases.

A few additional cases of the latter type in which caudal, abdominal or combined techniques were employed have been published by, among others, Masson & Simon (1928), Bueerman (1932), Wilensky & Kaufman (1940), Meade (1942) and Dixon (1942). Most of these cases, however, were combined with various degrees of prolapse of the uterus, requiring surgical intervention, usually hysterectomy. In one of Bueerman's cases a protrusion to the rectum—rectal hernia—which caused a sensation of rectal filling was discovered after the operation.

The main difficulty with regard to that type of deep rectogenital pouch which protrudes towards the rectum is that evaluation is complicated by the failure to distinguish between different forms of prolapse in a great part of the literature. Disregarding the method

of simply excising the prolapsed part of the bowel (Mikulicz, 1889; Cunningham, 1909), the traditional concept of rectal prolapse as a result of pelvic floor weakness has set its mark on therapy mainly through the advent of various procedures to strengthen the pelvic floor. Duval & Lenormant (1904) and Lynch (1915) made narrower the external anal sphincter, Rehn (1886), Roberts (1890), Delorme (1900), etc. folded and excised the rectal wall, Tuttle (1903), Sick (1909) and Lockhart & Mummery (1939) performed sacrococcygeal fixation of the rectum. Various plastic operations on the levator ani and the ligaments of the pelvic fascia were employed by Duval-Lenormant (1904), Lynch (1922) and Maes & Rives (1926). The latter group of surgeons, however, have also assumed that a deep rectogenital pouch is one of the predisposing factors. Lynch, for example, put a duplicature in the lateral ligaments of the rectum ventrally of the rectum. The same operation has recently been performed via the abdominal route in a few cases by Hayes & Burr (1948). The plastic repair done by Maes & Rives consisted in restoring the normal angulation of the rectum, which makes the rectogenital pouch more shallow. Of the three cases thus treated only one was followed up: 5 months later there was a perfect result.

The view was advanced fairly early that a deep rectogenital pouch is a predisposing factor for rectal prolapse but it has entailed surprisingly few reports of applications of the logical method of operation, which was also advanced at an early date. Its principle is by a row of sutures from the bottom of the rectogenital pouch up to a suitable level to obliterate the deep peritoneal pocket and, thereby, to prevent the ventral rectal wall from caving in. The method was envisaged by Bardenheuer-Sonnenschein (1902) and improved by Quenu & Duval (1910) who simultaneously anchored the sigmoid loop in a special manner. Moschcowitz (1912), giving a more detailed account of the principle, described 9 cases in which only obliteration of the rectogenital pouch was performed. Among the 8 patients who survived the result was good in 5 while the others showed normal conditions during defecation and coughing but a small mucosal prolapse during maximal strain.

Rankin & Priestley (1933) obliterated the rectogenital pouch in 9 cases of large prolapse. They pointed out that there was some risk of intestinal obstruction inherent in this operation (which in one of their cases had a fatal outcome) and therefore recommended that a rectal tube be inserted for 6 –8 days after the operation. In 7 of their 8 surviving patients the result was very satisfactory, and in the eighth there was great functional improvement despite signs of relapse.

Mayo (1938) proposed that strips of fascia lata should be used to strengthen the pelvic floor in conjunction with obliteration of the deep rectogenital pouch, but he offered no information regarding the results of such treatment.

After laying bare and excising the deep peritoneal pocket, Graham

(1942) modified the method by reconstructing the levator plate ventrally of the rectum, thereby restoring its normal curvature. Then he closed the peritoneum cranially of the plastic repair. This technique is evidently the abdominal counterpart of the above caudal method adopted by Maes & Rives. A follow-up examination of Graham's three cases, the first of which had been treated 3 years before, disclosed no signs of a relapse.

Another development of the same principle has been given by Hultén (1946) who introduced the technique to Scandinavian surgical practice. Having coagulated the peritoneum, he obliterated the rectogenital pouch in 6 cases, 2 of which were psychoses with extreme compulsive straining. In 5 of these cases the very long sigmoid colon was, in addition, resected, after which temporary colostomy was done. The latter was closed after 1—2 weeks. This procedure had a threefold aim: to reduce the long sigmoid loop, to achieve better fixation of the bowel, and to lessen the risk of postoperative intestinal obstruction. The longest period of observation, that of the insane patients, was 7 years, 3 years was the next longest and then came shorter periods, all cases without signs of relapse.

The suspension factor in operations for rectal prolapse was emphasized by Orr (1947) who, in conjunction with the obliteration, affixed the raised rectum to the hard fascia on the promontory and sacrum with strips from the fascia lata. This technique was applied in 3 men and a woman without giving rise to constriction or angulation of the sigmoid and with restored rectal function.

Hayden (1947) published his experiences from 60 cases of rectal prolapse, 43 of which were treated operatively by obliterating the deep rectogenital pouch, although various supporting measures were taken in the majority of these cases. Obliteration only was done in as few as 6 cases, 5 of which were followed up. Three showed no relapse after 4, 5 and 13 years, respectively, one relapsed within 6 months and one within 2 years.

By combining the obliteration method with Graham's levator reconstruction, other authors have added another technique to the many operations for rectal prolapse. By so doing, Aronsson (1950) operated on 3 patients in whom the preliminary result with regard to the prolapse was satisfactory 1 $^1/_2$, 1 and $^1/_2$ years later.

The authors preliminary paper (Walldén, 1948) reported 17 operative obliterations of a deep rectogenital pouch by Hultén's method, without postoperative complications or fatalities. The effect on the blocking symptom was very satisfactory, but in the oldest case the period of observation was no more than 2 years.

Summary and Aims

A large number of surgical procedures for various clinical manifestations of deep rectogenital pouch are given in the literature. The above review is chiefly concerned with interventions that have for their object to give the rectogenital pouch normal depth. The trend in the literature is towards a more frequent use of the abdominal route for obliteration of the caudal part of the pouch. Early experiences of the obliteration procedure are of interest mainly for the present author's prolapse cases, whereas his defecation block cases were assembled according to other principles and therefore must be judged from a different basis. The intention now is to account for indications, technique and postoperative course, with special emphasis on the defecation block cases.

The Author's Experiences

Materials. The total series of 52 cases included 40 in which operation was performed, 28 being defecation block cases and 12 prolapse cases. Their distribution is given in table 10, p. 40.

A. Indications

Nowadays most researchers probably agree that true rectal prolapse demands operative treatment, though opinions still differ as regards the choice of method.

With regard to surgical therapy in defecation block following deep rectogenital pouch there is no tradition to fall back on. A correct understanding of the blocking mechanism is accordingly of fundamental importance for this problem. If abdominal press in deep rectogenital pouch elicits collapse of the ampulla recti instead of the dilatation normally precipitating the final defecation reflex, attempts should be made to bring about emptying of the bowel without straining. The possibility of achieving this is demonstrated by some of the cases in the author's series. We find, for example, that anxiety or other irritation associated with increased peristalsis may reduce or completely eliminate the blocking symptom. The symptoms may also become less prominent during periods of resting from a harassing job. The histories reveal that the symptoms, although steadily becoming more constant and prominent, have varied in degree. It is possible, therefore, at any rate in the early stages, that some patients may get rid of this trouble by being taught sound bowel

habits and by having their environmetal conditions adjusted accordingly. It is evident, however, that the patients' own efforts to seek a solution to their problem or their attempts to obtain aid from doctors have seldom yielded appreciable results.

The relief from the blocking disorder experienced by some patients during certain periods or associated with increased intestinal motility might result from peculiar anatomical conditions. A narrow entry to a deep and broad rectogenital pouch is equivalent to a relative obstruction to movement of the intestines up and down in the pouch. It is therefore possible that bowel is not always pressed down to the bottom of the pouch by straining. It is conceivable, moreover, that increased intestinal motility may spontaneously restore the bundle of bowel loops in the pouch to the abdominal cavity proper.

Even if it is in all cases desirable and in some practicable to manage these patients' disorders by inculcating good bowel habits, in doing which an understanding of the mechanism is obviously most important, there probably remains a group in which such measures are vain. If in such cases the symptoms have the intensity and long duration often exhibited by the author's patients, operative therapy should be contemplated, provided that the operation is likely to be effective and unlikely to be associated with inordinate risks or complications.

B. Preoperative Routine

The bowel was emptied by an enema on the evening before the day of operation, the bladder was emptied immediately before the operation, and the area for the incision was prepared in the usual manner. No other measures were considered necessary.

C. Anesthesia

Excepting two cases in which general anesthesia with nitrous oxide and ether was employed, all the operations were performed under spinal anesthesia with hypobaric nupercaine whose effect reached to or beyond the costal arch. The usual premedication was morphine or morphine and scopolamine.

D. Operative Technique

Laparotomy was done via an infraumbilical, median or paramedian incision, except in two cases where Pfannenstiel's transversal incision was used.

Since the abnormal depth of the rectogenital pouch was considered due primarily to defects of the rectogenital septum and its connections with the pelvic fascia, it seemed logical to try to imitate the processes during

normal fetal life, when the deep rectogenital pouch is obliterated and the rectogenital septum formed by fusion of the ventral and dorsal wall of the former. Even if it is possible to make such a reconstruction by the caudal route, the procedure meets with certain technical difficulties, at least in the male. In addition to more favourable technical conditions for surgery, abdominal exploration offers better opportunities for diagnostic inspection as well as for complementary procedures, e.g. in dislocation of the uterus. In those caudal or abdominal methods by which the caudal part of the abnormally deep rectogenital pouch is excised as a hernial sac, some of the material for reconstruction of the rectogenital septum is removed. Admittedly, after this excision the levator and ligaments are usually sewn together ventrally of the rectum, which is supposed to protect its ventral wall from the effects of straining, but as the diastasis between the levator branches might be part of the congenital defect and, moreover, there is sometimes muscular atrophy, the described technique seems to suffer from some drawbacks.

For the author's cases the principle of obliteration was adopted in the form devised by HULTÉN for operation of true rectal prolapse. However, temporary colostomy, as recommended by him, was done only in 6 patients whith prolapse and a remarkably long sigmoid loop. Postoperative bowel patency was ensured in some of the other cases by inserting a tube wich reached into the sigmoid and was left there for some days. There was probably much less risk of intestinal obstruction in the cases of defecation block where there was no counterpart to the thickened wall existing in the cases of rectal prolapse. The tube was therefore omitted in the 5 most recently treated cases of defecation block as it created quite a lot of diçcomfort for the patients.

Electrocoagulation of the peritoneum is considered an important part of the surgical procedure. It activates the obliteration process and probably reduces the risk of encapsulated peritoneal cysts. But most of the obliterating effect is achieved by the row of purse string sutures, averaging 10 in the cases of defecation block, which are taken 1—2 cm apart from the bottom of the pouch as far up as the peritoneum and fascia are capable of being drawn together (Fig. 68). It is important that the heavy-gauge silk sutures grip also the subperitoneal fascia, both beside the pelvic organs and on the rectum, prostate, vagina and uterus. In taking the sutures attention should be paid to the pelvic veins and the ureters so that these may not be damaged. The operation as a rule presented few technical difficulties, but the slight width of the rectogenital pouch in one of the prolapse cases made the caudalmost sutures hard to apply.

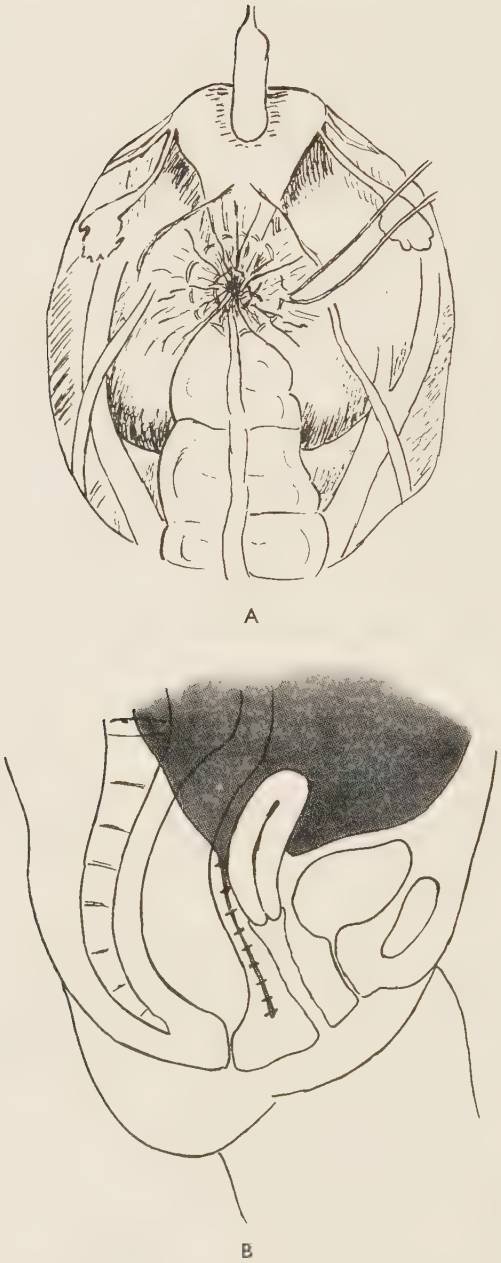

Fig. 68. Diagram of the surgical obliteration technique. A. The pelvic cavity as seen from the incision with a few purse string sutures taken in the bottom of the pouch; B. Median section showing conditions when all sutures have been taken.

After the obliteration the peritoneal bottom in the male cases stretched between the dorsal aspect of the bladder cranially of the prostate and the promontory or a point immediately caudad to it. In the female cases the pouch was sutured up to the corresponding level, ventrally lying at the same height as the boundary between the cervix and corpus of the uterus, and this often gave rise to retroposition or retroversion of the uterus, unless the rectal mesentery permitted the ventral wall of the rectum to be pulled farther ventrad. In 6 of those defecation block cases in which the uterus was initially dislocated dorsad and suspended in flaccid and atrophic ligaments its ventral aspect was affixed to the ventral wall of the abdomen. Either this was done by suturing the uterus directly to the dorsal aspect of the sheath of the rectus, after removal of the peritoneal investment at the points of contact, or by shortening the uteroinguinal ligaments by pulling them out through the sheath of the rectus, crossing and suturing them on its ventral aspect.

The operation was accompanied by excision of a small myoma node of the uterus in one of the defecation block cases, extirpation of a healthy appendix in 4 cases and sterilization by salpingectomy in one case.

The temporary colostomy in some of the prolapse cases was carried out along the lines laid down in HULTÉN's work (1946).

E. Postoperative Course

After the operation the patients stayed in hospital for varying lengths of time. The average length of postoperative treatment was 14 days for the patients with defecation block, and 44 days for the patients with rectal prolapse. The long treatment for the latter group was due to the time required for the healing of the temporary colostomy. In addition the small group included a patient who postoperatively displayed signs of a cancer of the pancreas which had up till then been overlooked, and for which he remained at hospital until he died. The shortest postoperative care in the prolapse group was 16 days. For several of the defecation block cases the treatment was prolonged by postoperative roentgenographic control examinations. The shortest postoperative treatment in this group was 8 days, a time which need scarcely be exceeded when the course is uneventful. Disregarding the aforementioned patient with cancer of the pancreas, there were no postoperative fatalities or complications save a few cases of cystitis which readily responded to chemotherapy.

The mode of postoperative treatment in the cases of defecation block was that ordinarily adopted after abdominal operations, with ambulation

1—2 days after the operation. Noteworthy meteorism only occurred in one patient, a woman with remarkably slack abdominal musculature. To facilitate postoperative evacuation of the bowels 1—3 tablespoonfuls of liquid paraffine were given over varying periods to 19 patients, 1—3 teaspoonfuls of "normalax" to 3 patients, while the first evacuation was unaided by specific medication in 5 cases. The bowels moved spontaneously after 4—5 days in 2 of these cases, but in one case rather a troublesome abdominal flatulence made it necessary to administer an enema which precipitated an evacuation of solid residues of roentgen contrast. Thereafter the bowels moved normally. Another patient in the same group had such a great urgency to move the bowels on the first postoperative days that he scarcely had time to get to the lavatory. A similar reaction occurred in a patient who had been given paraffin for two days. Although medication was discontinued there was frequent urgency with loose stools, and this went on for several days. In the majority of cases the first bowel movement occurred 4—6 days after the operation, but in some it did not occur till 10—12 days, and in one case even 15 days after the operation. The bowels of two women had not yet moved spontaneously when they were sent home, but they did evacuate enema fluid without the former blocking sensation.

Though most of the patients once defecation had started almost daily evacuated stools of normal shape and consistency the primary result of the operation must in the first place be judged from another point of view. The operative intervention was in fact not designed to cope with the intestinal motility as such, but rather with the anatomic deviation in the true pelvis which was the assumed cause of the blocking symptom. It is consequently more relevant to study the effect on that score. It appears that the formerly more or less intense sensation of a rectal block to bowel evacuation had ceased in all cases. This applied also to the two women whose bowels moved only when aided by enema. Preoperatively a woman was unable to distinguish clearly between the blocking symptom and a series of other abdominal and evacuation disorders. But the improvement after the operation was so obvious that she immediately realized the characteristic nature of the former evacuation disorder. Several patients declared that the passage for the stools felt remarkably wide. Some expressed their astonishment at the result which they "hadn't thought would be so good" or which they "could hardly believe". Even if the described change is obvious to one who has had the opportunity of observing these patients before and after the operation, the results must be judged with a very critical mind. In addition to those beneficial

effects which the mere hospital routine may have on chronic defecation disorders—though in these cases they were present only after the operation—the field is open for various degrees of suggestibility. A fair evaluation of the results must therefore await follow-up examinations undertaken with a longer perspective.

Summary of Views on and Observations from the Author's Work

The primary indication for operative treatment in deep rectogenital pouch has formerly not been defecation disorders, if such were at all observed, but other symptoms, usually similar to those in prolapse of the uterus or associated with prolapse of the rectum. Generally speaking, defecation block is a new indication for surgical therapy. When operation is contemplated it is important to take into consideration the nature of the blocking mechanism and the effect of other forms of therapy. Certain measures of bowel hygiene may possibly alleviate the distress, but in refractory cases with severe symptoms of long duration surgery should be contemplated if it is likely to have the desired effect and if it is not combined with disproportionate risks.

On the question of operative technique the importance is emphasized of electrocoagulation of the peritoneum as a means of activating the obliteration process. When the caudal part of the rectogenital pouch is sewn up the sutures should be firmly anchored in the pelvic fascia in order to achieve a stronger plastic repair. On the other hand, suturation ventrally of the rectum of the often atrophic levator branches is a more questionable procedure.

There was no fatality or significant complications during the postoperative course. The blocking symptom ceased in all cases.

CHAPTER 7

Consequenses of the Operative Therapy in the Author's Cases

A. Cases of Defecation Block

Symptoms

Whereas it is usually easy to assess the effect of an operation in a case of true rectal prolapse, the matter is a bit more complicated in cases of defecation block. By rectal palpation and roentgen examination it is, of course, easy to check the correction of the anatomical anomaly, but it is more difficult to evaluate the operative result with regard to the defecation disorders. In several histories the symptoms set in periodically so freedom from symptoms would not necessarily be associated with the operative intervention. It follows that the duration and degree of the symptoms must be taken into account when the subjective condition is evaluated. Another important point is to distinguish clearly between symptoms of defecation block and symptoms of so-called constipation, for the former may be completely absent although the patient suffers from, for example, delayed evacuation with or without hardening of the fecal masses. And such a disorder may remain after the operation and give rise to considerable distress although a long-standing and severe state of defecation block has been eliminated. But several examples show that the disappearance of the blocking symptoms was accompanied by freedom from other types of evacuation disorders. In the majority of cases the patients' subjective condition was checked at repeated interviews, and up-to-date information of all cases was collected just before this publication went to print.

The result was considered good if the blocking symptoms disappeared and other evacuation disturbances, if present, abated or vanished. The condition was considered fair when there was considerable improvement but sporadic and mild symptoms of block persisted, or when the defecation block vanished but other evacuation disorders were so prominent that special steps had to be taken to secure adequate evacuation of the bowels. The result of the operation was considered poor if the blocking symptoms persisted or returned after some time to become the dominating feature of the defecation disorder.

TABLE 15.

Interval between operation or first examination and the time of obtaining the data	Distribution of the cases according to the course up to and the subjective condition at the time of obtaining the data						Total
	Operated			Not operated			
	Good	Fair	Poor	Good	Fair	Poor	
< 1 year	2		1			2	5
1 < 2 years	1	1	1				3
2 < 3 years	3	1	1			1	6
3 < 4 years	5	2	1	1	1	4	14
4 < 5 years	7		1			3	11
5 < 6 years		1					1
Total	18	5	5	1	1	10	40

Table 15 gives the times elapsed from the operation—or the first examination in unoperated cases—to the follow-up examination, and the distribution of the cases with regard to the course and actual condition. Among the operated cases 18 were practically free from symptoms, 5 exhibited rather moderate improvement and, after an intermission, 5 became worse with relapse of the blocking symptoms. Among the unoperated cases 10 on the whole were unchanged, while a young woman showed no symptoms at all and another young woman complained of periodic onsets of slight symptoms. At the time of the folow-up examination the latter patient (No. 32) happened to have such a period. Roentgenologically and at rectal exploration she had a very deep rectogenital pouch. (Cf. Fig. 38.) The patient who had no symptoms at follow-up examination had had typical defecation block for some months but she showed fully normal conditions a both rectal exploration and

TABLE 16.

Duration of blocking symptoms before the operation or first examination	Distribution of the cases according to the course up to and the subjective condition at the time of obtaining the data						Total
	Operated			Not operated			
	Good	Fair	Poor	Good	Fair	Poor	
< 2 years	4	1		1		3	9
2 < 4 years	10	1				5	16
4 < 10 years	3	3	3		1	1	11
> 10 years	1		2			1	4
Total	18	5	5	1	1	10	40

roentgenological examination. Despite this negative status she was included in the series on account of experiences of another case (No. 11), in which a young woman showed the same lack of agreement between symptoms and signs at the first examination. At a later examination, however, there was a very extensive caudad bulge of the ventral rectal wall during straining, and laparotomy revealed an extremely deep recto-genital pouch filled with small bowel. (Cf. p. 50.)

In order to appraise the relationship between present conditions and the measures taken it would be valuable to have a classification of the series according to the previous duration and degree of the blocking symptoms. However, the inability of some patients to fix the time of onset of the blocking symptoms would make such a classification a difficult procedure. This applies particularly when other bowel evacuation disorders have long been present. Such a classification has nevertheless been attempted. The data, which in respect of the duration of the symptoms are given with reservation, are assembled in table 16. If the table justifies a conclusion, it is that operative therapy was less successful when defecation block had been present for more than 4 years.

The small groups warrant no far-reaching conclusions concerning the relation between the patient's age and the condition at the follow-up examination. It may be mentioned, however, that when they were operated upon the 5 patients showing a poor condition were between 35 and 50 years old and, thus, did not represent an extreme age level.

It might be possible to classify the patients more objectively according to the degree of the findings originally made at rectal exploration, roentgen examination and operation. But, as noted previously, a consistent plan was not always adhered to in recording these findings. Moreover, the material is probably inadequate to warrant such a detailed analysis. Nevertheless it is remarkable that the condition was often excellent at follow-up examination even when the anatomic deviation was extreme as seen at operation.

Signs

The objective condition was repeatedly and most recently at the follow-up examination checked by rectal palpation. Particular attention was paid to the behavoiur of the ventral rectal wall during straining. In the operated cases the caudad protrusion was absent in 21 instances, slight in 2, moderate in 3 and considerable, i.e. reaching to the anorectal ring, in 2 cases. In the two latter cases less than 2 years had elapsed since the operation.

More than half of the patients who were operated on were, in addition, examined roentgenographically after various lengths of time. The depth of the small bowel in the true pelvis, particularly in its dorsal part, was then found to be less often considerably so. Measurements were taken also on these films, but the small number of subjects and the relatively schematic measuring technique have had the result that even if statistically significant the difference is not so marked as it deserves to be.

Pregnancy and Parturition

Two women have been pregnant after the operation. In one of them (No. 25) gestation started 6 months after the operation and ended by spontaneous abortion 4 months later. Once before the operation there had been a miscarriage. No genital abnormalities were disclosed at gynecological examination. At the follow-up examination three and a half years after the operation the ventral wall of the rectum bulged down during straining to a level a few cm cranial to the anorectal ring. The patient said she had mild blocking symptoms from time to time but she felt much better than before the operation.

The other woman (No. 14) has borne children twice, the first time 1 year and 3 months after the operation and the second time 4 years after the operation, when she had twins. Both times everything went fine. At rectal examination 5 months after the 1st birth there was no caudad protrusion of the ventral rectal wall. She then was and still is absolutely free from symptoms of defecation block and is very pleased with the result of the operation.

Relapses

After a transient improvement of the blocking symptom 5 operated cases again relapsed. One of these patients (Case 5) was doing remarkably well when examined one month after the operation. He felt no symptoms whatever of defecation block and was very satisfied with the result of the operation. Two years after the operation the patient died in pulmonary tuberculosis, and could therefore not be subjected to a follow-up examination. His wife stated that his defecation disorder had been back for some time. In the remaining 4 cases the course may be summarized as follows:

Case 3. A man of 35 who had had typical defecation block since 7 years. The palpatory and roentgenological signs were pronounced. A very deep rectogenital pouch was observed at operation. Postoperatively he was wholly free from symptoms for 8 months. Then,

suddenly and for no obvious reason, almost on the hour, the old blocking symptoms returned. It felt as though something lay alongside the rectum, during straining compressing it. At rectal exploration the ventral rectal wall bulged caudad right down to the anus, just as it did before the operation. Protruding caudally, the mass covered the dorsal aspect of the prostate to the tip. The patient stated 4 years after the operation that the blocking symptoms persisted undiminished. Their degree was such that he requested a second operation.

Case 15. This was a 36-year-old woman with defecation block since childhood. At palpation during straining the ventral wall of the rectum bulged down to the anorectal ring and the retroflected uterus was in immediate contact with the coccygeal tip. At operation the bottom of the peritoneal cavity lay 2 cm caudally of the coccygeal tip, and the dorsal aspect of the vagina was almost wholly invested by peritoneum. Light fingerpressure on the bottom made it bulge a few more cm caudad. After the operation, which was combined with ventrofixation of the uterus, the patient was at first relieved of blocking symptoms but she was unable to empty the bowel without aid of an enema. The blocking disturbance later returned with approximately the same severity as before the operation, but the latest examination 10 months after the operation revealed no caudad protrusion during straining of the ventral rectal wall. She then stated, however, that defecation was easier if she accompanied straining by manual pressure on the perineum.

Case 19. A woman aged 50 with bowel evacuation troubles of 10—15 years' standing, in recent years of a distinct blocking type. During straining the ventral rectal wall bulged caudad and pressed the examining finger against the dorsal aspect of the rectum. The roentgen image disclosed an unusual depth of the small bowel in the true pelvis. In addition to the abnormal depth there was observed at operation an adhesion between the sigmoid and a myoma of the fundus uteri (Fig. 35). Postoperatively the patient was free from blocking symptoms for a short time but could not empty the bowel without an enema. The blocking troubles later returned, possibly in a higher degree than before the operation. At rectal palpation the pelvic floor was found to be very flaccid, and it moved several cm caudad during straining. At the same time the ventral rectal wall and the slightly enlarged uterus bulged caudad to the anorectal ring.

Case 26. (See p. 105).

Subsequent Operations

The postoperative condition in three cases was such that further surgery was indicated. Though they were not of the same type they all had to do with bowel evacuation.

Case 10. A man aged 65 with severe defecation block since 8–10 years. At rectal palpation, roentgenological examination and operation there was observed a very deep and wide rectogenital pouch which was filled with small bowel. The operation caused the blocking symptoms to disappear but the bowels could, as before, be evacuated only with the aid of an enema. The patient said he felt no urge to defecate though the rectal ampulla was filled with fecal matter. As this was thought to be due to considerable weakening of the pelvic floor so that the ampulla was displaced caudad (see Fig. 25), the pelvic floor was subjected to plastic repair. The levator ani was very atrophic and looked like

thin curtains separated by a 2—3 cm broad diastasis dorsally of the anus. The rims of the levator with the fasciae were sewn together to form a dorsal platform beneath the caudal part of the rectum between the coccyx and the anus. After a short period of improvement with spontaneous defecation every 2nd or 3rd day, the symptoms recurred and since then the patient has had to resort to enema-aided evacuations. However, five and a half years after the first operation he noted that the old blocking symptoms hade gone and enema fluid could be evacuated without trouble. At palpation the pelvic floor defect was then as marked as before the last operation, but the ventral rectal wall no longer bulged caudad during straining.

Case 18. A woman aged 47 with pronounced blocking symptoms. At palpation and roentgenologically the rectogenital pouch was very deep, and this was verified at operation. The operation had a very beneficial effect on the blocking symptoms. After a year evacuation troubles again set in, but of another type. This time too the patient felt something getting in the way of the faeces, but it was situated farther cranially than before the operation. The faeces were extruded in the form of a narrow strip and even the passage of gas was difficult. At rectal exploration the examining finger felt no caudad bulge of the ventral rectal wall. Sigmoidoscopically a sphincterlike closure of the lumen was observed about 20 cm up the rectum; it was not opened by air insufflation. The region was adherent to the promontory. Roentgen examination of the colon revealed a small annular constriction of the lumen at the site of the sigmoidoscopically observed impediment. At operative exploration of the abdominal cavity it was found that the bottom of the peritoneal cavity lay immediately caudad to the promontory in about the same manner as after the preceding plastic repair. In the centre there was a shrinking cicatrix on which converged several peritoneal folds from the abdominal wall. These folds were rather high and solid and plainly contained some of the pelvic fascia. In level with the central cicatrix joining the ventral aspect of the rectum and the dorsal aspect of the uterine cervix the rectum was partly strangulated, chiefly by means of two folds going bilaterally from the dorsolateral part of the pelvic wall ventromediad to the central cicatrix. The sigmoid was slightly dilated and its wall manifestly thickened. The scar was excised and the cords to the pelvic wall partitioned. This relieved the strangulation of the rectum. Afterwards the bowels could be evacuated without trouble, and at the follow-up examination 4 years after the first operation the condition still remained very good.

Case 26. A woman aged 45 who had had evacuation disorders since 13 years and had been unable for the last 5 years to defecate without the aid of enemas. At rectal palpation the uterus was felt lying retroposed in the deep rectogenital pouch which during straining reached down to the anorectal ring. Roentgenographically the small bowel was seen to descend deeply in the ventral part of the pelvis (see Fig. 41). At operation the uterus was found retroposed into direct contact with the pelvic floor and rectum. The deep rectogenital pouch extended 2—3 cm caudally of the vaginal portion. It was remarkable that the genitovesical pouch, too, was very deep—it extended almost as far caudad as the rectogenital pouch and reached the vaginal portion. A large part of the small bowel lay in this ventral pocket. After obliteration of the rectogenital pouch the patient was free from blocking symptoms for 5 months, but then they returned and ultimately became even more pronounced than before the operation. Since during straining the uterus was still pressed against the coccyx and the small bowel went abnormally far caudad in the ventral part of the pelvis, the genitovesical pouch was also obliterated 7 months after the first operation, and at the same time the uterus was fixed to the symphysis with

strips of the fascia lata. After that the patient was perfectly well for 2 months. Then she once more began to feel something slide down during straining which ultimately produced complete defecation block. Only enema water and very soft stools could flow past the impediment. At rectal palpation the uterus was retroposed and filled the ampulla. The various fixation procedures had thus been ineffective.

B. Cases of Rectal Prolapse

These cases are of interest here mainly because they were operated in fundamentally the same manner as the cases of defecation block. In some of the prolapse cases, however, the obliteration was combined with temporary colostomy following resection of a long sigmoid loop. Since the weakness of the pelvic floor and of the other supporting structures of the pelvic organs are often far more severe in rectal prolapse than in defecation block, the former constitute a more exacting test of the tenacity of the obliteration. The results of the follow-up examinations for all the prolapse cases are given in table 17.

In this series of patients, with an observation period of up to 13 and a half years, there was pronounced recurrence of the prolapse in one case and in another patient with a weak sphincter a tiny bit of the rectal wall protruded through the anus during straining, but the condition

TABLE 17.

Results of operation in the cases of rectal prolapse.

Sex	No.	Age when operated	Temporary colostomi	Period of observation after the operation	Recurrence	Persistent incontinence
Men	41	40 years	+	13 ½ years	—	—
	42	40 years	+	8 years	—	?
	43	77 years	+	3 months	—	+
Nulliparous Women	44	27 years	—	1 year	—	—
	45	47 years	+	6 years	+	+
	46	56 years	—	4 ½ years	—	+
	47	61 years	+	10 years	?	+
Parous women	48	52 years	+	4 years	—	—
	49	55 years	+	5 ½ years	—	—
	50	62 years	—	4 ½ years	—	+
	51	64 years	+	8 ½ years	—	—
	52	67 years	—	6 months	—	+

scarcely warranted the name of relapse. The remaining 10 cases have been absolutely free from recurrences.

The patient with a recurrence (No. 45), who was subjected to a follow-up examination 6 years after the operation, had for about a year felt that the prolapse had returned. An orange-sized prolapse of ordinary appearance was found at examination. The pelvic floor musculature was fairly firm but the sphincter was weak. At operation loops of small intestine and a rectum provided with a high mesentery was found lying in the peritoneal cavity of the true pelvis. As a remnant of the old obliteration there was a cicatricial shrinkage on the ventral aspect of the rectum in level with the vaginal portion. Both dorsally and laterally of the rectum on either side of the high mesentery the peritoneal cavity went right down to the pelvic floor where the examining finger felt the tip of the coccyx and the anal opening through which the thick wall of the rectum was easily pressed out. After diathermal coagulation of the peritoneum the cavity was sewn up dorsally of the uterus from the bottom up to the level of the promontory. At examination 6 months later the patient was free from recurrences.

In 5, or perhaps 6, of the cases the sphincter remained weak and gave rise to a more or less troublesome incontinence. Two or three of these patients had observed a slight improvement in this respect after the operation, but in the other cases the disorder apparently remained unaffected. This observation confirms earlier reports of the obliteration procedure which, of course, is not directed specifically against loss of sphincteric tone.

Of special value when it comes to an appraisal of the efficacy of the method is the absence of recurrences for 8 and 13 and a half years respectively in the two psychiatric patients with compulsive straining. In these cases the resection of the long sigmoid loop and the temporary colostomy were probably important.

Summary and Comment

Cases of Defecation Block

The blocking symptoms disappeared or were materially reduced in the majority of the 28 patients who underwent operation. Only 5 cases showed no improvement. At rectal palpation two of them displayed a pronounced relapse of the anatomical abnormality, with marked bulging of the ventral rectal wall during straining. In one of these cases the symptoms set in abruptly 8 months after the operation. Apart from 3 other cases, in which moderate bulging occurred, the operation seems to have resulted in a good fixation of the ventral wall of the rectum. Among those not operated on there was a patient who was completely

free from symptoms at the follow-up examination, another was much better and the rest were the same or worse.

The two groups of the defecation block cases are not altogether comparable. The series not operated on is smaller and contains a few very old patients. Some of them were out-patients and had consequently not been subjected to the regular hospital routine. However, instructions on defecation hygiene were given to both groups, particular emphasis being laid on the importance of cultivating a habit of regular defecation with a minimum of strain.

The patients had usually been undergoing various forms of dietetic and medicamental therapy, though the effect on the blocking disorder had if anything been insignificant. The indications for operation have been dealt with previously, and it was then mentioned that protracted and severe symptoms may justify an operation. Accordingly, most of patients who had not undergone an operation had moderately severe defecation block. Some were more seriously affected but an operation was not undertaken because of the patient's age or indecision. In order to make sure that the symptoms were permanent most of the operative cases were kept under observation for varying lengths of time before the operation, in two cases for more than 6 months. Experience from these observation periods may be added to those from the unoperated cases.

Even if these differences prohibit statistical comparison of the two series, the dissimilarities in the results would seem sufficiently remarkable to warrant continued trials with the operative form of therapy.

Two women have been pregnant after the operation. One of them had a spontaneous abortion, but it was probably quite unassociated with the operation. It is more interesting to note that the other patient underwent two pregnancies, one of them with a twin birth, without a relapse of the blocking symptoms.

In five cases, of which brief histories are given, the blocking symptoms recurred. Although infavourable constitutional or functional factors may have contributed to the poorer results in some of these cases, it seems probable that the ineffectiveness of the obliteration method was largely dependent upon demonstrated relapses of the anatomical anomaly or on an equivalent state of weakness in the structures surrounding the rectal ampulla.

After the obliteration three patients were subjected to additional surgical interventions because of bowel evacuation abnormalities. In the first case the obliteration had in fact caused the blocking symptoms to disappear, but the bowels could be emptied only with the aid of enemas.

The pelvic floor was in this case extremely weak and the rectal ampulla had descended. Subsequent plastic repair of the pelvic floor neither had the desired anatomical result nor improved the evacuation of the bowels. The second case must be regarded as a complication to the obliterating operation. At renewed operation there was demonstrated a shrinking cicatrix on the ventral aspect of the rectum. This might have been the result of a haematoma or, possibly, of necrosis following too tight sutures. That is probably how the taut peritoneal folds were formed which by compressing the rectum set up an obstruction to the passage of faeces. The case may serve to make it clear that the sewing up of the peritoneum and pelvic fascia should not reach so far craniad as to overstress the tissues. The third case was a complete failure. The considerable depth of the peritoneal cavity on the dorsal as well as the ventral side of the uterus and the retroposition of the latter indicate that the pelvic floor and the other supporting apparatus for the pelvic organs were extremely weak. Nevertheless no signs of prolapse of the uterus could be found at gynecological examination. The patient's bowel condition had at the time of writing deteriorated so much that colostomy was contemplated.

Cases of Rectal Prolapse

Tables give the results of operation in 12 cases, in 10 of which there had been no recurrence. 1 patient showed a marked relapse and another a vestigial new prolapse. The period of observation was respectively 8 and 13 and a half years in two psychiatric cases with compulsive straining. In neither case was there any sign of a recurrence, which must be considered a severe test of the strength of the obliteration. In the case with a recurrence the peritoneal cavity in the true pelvis had fallen down at the sides and dorsally of the rectum to the pelvic floor, while a cicatrix from the previous operation situated on the ventral aspect of the rectum in level with the vaginal portion marked the bottom of the peritoneal cavity ventrally of the rectum. In 5 or 6 cases there were sphincteric weakness and incontinence.

General Summary

The author's investigations constitute the first attempt at a more systematic study of the relationship between an abnormally deep rectogenital pouch and a certain type of defecation disorder. Earlier publications sporadically have referred to such a relationship, but here it is regarded as a separate and characteristic disease entity.

First comes a review of the normal anatomy, as set forth in standard textbooks and in certain roentgenological works on the abdominal region in question. To provide a background to the study of the pathological material the results of the author's investigations in cases without bowel evacuation disorders are given. Rectal palpation was performed in a series of 40 patients with irrelevant disorders, and in a similarly composed and equally large series the pelvic peritoneal cavity was explored at laparotomy. The palpatory and operative findings, which are given in the form of tables, demonstrated that the caudal part of the rectogenital pouch was a fairly narrow space which usually contained no bowels. Its bottom was as a rule in level with the vaginal portion or the base of the prostate and it was not displaced much by straining. A specially developed roentgenological method whose sources of error have been analyzed was employed in examinations of just over 100 healthy persons. These examinations, which were done with the test persons standing up both with and without strain, had for their object to determine the shape of the rectum, the position of the pelvic floor and the depth of the small bowel in the true pelvis. The findings made are illustrated by films typical of different patterns. The films were measured to provide data for statistical analysis. The results which were valuable chiefly for comparison with the pathological cases, showed that in most women the rectum extended caudad beyond the pelvic outlet, while such was the case in only half of the men. The pelvic floor in the men lay more craniad from the coccygeal tip than in the women, but its relative displacement caudad during straining was approximately the same in the two sexes. The depth of the small bowel in the true pelvis

was greater in the women but here, too, the relative displacement during straining was approximately the same as in the men.

The second chapter in the book contains an account of previously described types of deep rectogenital pouch as well as an abstract of the anatomical observations in the author's patients. Based on a series of 29 women and 11 men with defecation block, the palpatory findings showed that, particularly during straining, a marked caudad bulge of the ventral rectal wall was a characteristic feature. In extreme cases this bulge reached all the way to the anorectal ring, completely filling the ampulla recti and, occasionally, even opening the anus. The peritoneal cavity was explored at laparotomy in 28 of these cases. Almost consistently it was then found that the rectogenital pouch was abnormally deep and very wide and usually filled right down to the bottom with bowels or with a dorsally dislocated uterus. Sometimes the peritoneum was profusely wrinkled. This seemed to affect particularly its caudal part and make possible even greater deepening and widening. Occasionally the entry to the rectogenital pouch was a bit narrower than its caudal part. The characteristic features and variations of the palpatory and operative findings have been consolidated and compared with the results of the roentgen examinations. Exceptionally the latter revealed pelvic floor defects. The observations which were made on films with contrast in the small bowel are fundamentally more important. Even if it may be difficult in the individual case to draw the line between normal and pathological, several of the exposures made during straining in the cases with defecation block revealed that the small bowel was displaced so far caudad beyond the pelvic outlet that there could be no doubt that an abnormality was present. Representative films have been chosen to illustrate different types and measurements on the films have provided a statistical material permitting comparisons with the control series. Thereby statistically significant differences were obtained with regard both to the position of the pelvic floor and the depth of the small bowel in the true pelvis with as well as without straining. By way of comparison results of palpatory, roentgenological and operative examinations in 12 cases of true rectal prolapse are submitted.

The pathogenesis of deep rectogenital pouch is discussed from the points of view of previous investigations and of the author's own findings in a series of 63 fetuses from the midpoint of intrauterine life, as well as of certain observations in the clinical series. Earlier investigators' opinion that the caudal part of the rectogenital pouch is obliterated during the latter half of embryonal life has been confirmed by the author's observa-

tions. There is also reason to believe that a factor contributing to the obliteration is a diminution of the space available in the true pelvis owing to a relatively more rapid growth of the pelvic organs than of the bony pelvis and to simultaneous filling of the organs. Some evidence is moreover presented in support of the hypothesis that a deep rectogenital pouch during postfetal life is caused by inhibition of the normal embryonal obliteration. Furthermore some factors are emphasized that may predispose to the formation of various clinical manifestations of a deep rectogenital pouch.

The symptoms in deep rectogenital pouch are described mainly with respect to disorders of defecation. By collating the case histories of the author's patients it appears that they have in common a characteristic feeling, which is especially marked during straining, that some impediment to defecation is located in the rectum. The consistency of the feces and the interval between defecations are of no particular significance in cases of this type. Conservative therapy had had little or no effect on the symptoms of defecation block which were often severe and of long standing and had usually been interpreted previously as symptoms of so-called chronic constipation.

A special chapter is devoted to a study of the mechanism of defecation block. Model experiments were made to illustrate certain mechanical factors which may influence the effect of straining on the rectum under both normal conditions and in deep rectogenital pouch. In the latter event the conditions are favourable for a collapse during straining of the caudal part of the rectum, whereas such a collapse is prevented by the supporting tissues surrounding the ampulla recti when the rectogenital pouch is of normal depth and instead the onset of the dilatation precipitating the final defecation reflex is probably promoted. Apparently the blocking effect can occasionally be reinforced by reposition difficulties through the narrow mouth of a deep rectogenital pouch.

If the blocking symptoms are severe and refractory to conservative treatment, operative therapy may be discussed. The earlier literature describes a large number of operative procedures for managing various kinds of hernial protrusions from a deep rectogenital pouch. The experiences are not all unequivocal, but there seems to be a general trend towards abdominal obliteration of the deep pocket. Without fatalities or serious complications the latter procedure was adopted in 28 of the 40 cases of defecation block and in the 12 cases of rectal prolapse. In both groups the immediate result of the operation was consistently good.

The late results of the operative treatment was estimated by making

follow-up examinations of the operated cases and comparing their condition with that of the unoperated cases. The observation period in the first operated case of defecation block was 5 and a half years. Among the operated cases 18 displayed practically no symptoms, 5 showed improvement, and 5 exhibited no change or a deterioration. Among the non-operated cases 1 was free from symptoms, one showed improvement and 10 exhibited a condition which was unchanged or worse. The effect of pregnancy and parturition after the operation is discussed on the basis of two cases. Brief histories are given of the 5 unimproved cases. In addition three cases are described which for various reasons were reoperated for bowel evacuation disorders. Lastly an account is given of the results of operation in the 12 cases of rectal prolapse, among which the longest period of observation was 13 and a half years. In one case there was a recurrence after 5 years, and 10 years after the operation another case possibly displayed the first signs of a new prolapse, but there was no relapse in the 10 cases remaining.

Addendum

When most of this work had gone to press the author had the opportunity of examining a case of defecation block which, giving in a nutshell the history, symptomatology and findings at examination, is well worth special notice.

The case is that of a 21-year-old medical student with evacuation difficulties of at least three years' standing. At first intermittent, the trouble is now constant. He has an almost unceasing urge to defecate, as though the rectum were filled with faeces. Often there are pains in the right groin and thigh, together with perineal tenseness and pressure. Sometimes the rectal discomfort is more pronounced immediately after meals when, moreover, there may be twings of pain in the abdomen. But the dominating distress is the difficulty of emptying the bowel. When he is straining at stool a little fecal matter of normal consistency at first escapes. Then there is total block. A new attempt after a while has a like result. As he is straining he plainly feels the rectum being filled down to the anus. By pushing aside with a finger the ventral wall of the rectum he has made defecation easier. Laxatives have no effect on the blocking sensation. Enema water comes out intermittently. Micturition has also been blocked at times. Not seldom he has experienced mild urination distress in the form of difficulty to start urination and frequent, often painful urges. These symptoms, too, have occasionally been more accentuated immediately after meals.

Over the past two or three months the patient has undergone a comprehensive set of clinical examinations, including radiography of the stomach and small and large bowel, faeces and urine analyses, and E. S. R., all with completely normal findings. The urination distress and a palpable swelling and tenderness over the prostate caused the examining doctor to suspect prostatitis. However, neither secretion analysis after prostatic massage nor urethrocystography confirmed this view.

When the patient presented himself for the final examination he described his symptoms so intelligently and characteristically that one

might have thought it was a matter of autosuggestion. Yet he knew nothing about the mechanism and was unaware of the author's studies. His own view was that he had haemorrhoids.

Clinical Data

The patient is a tall man of ordinary build in fine general health and appeared mentally well balanced. *The abdomen* displayed no palpatory abnormalities. *Rectum:* The anal canal had normal length and sphincteric tone. The ventral wall of the rectum bulged inwards down to the anorectal ring during straining, the dorsal aspect of the prostate being wholly covered by the bulging soft mass. The prostate itself was palpably normal. Proctoscopy and sigmoidoscopy produced no abnormal findings.

Roentgenological Findings

Examination in upright position with contrast in the small bowel even without straining demonstrated (Fig. 69) an uncommonly deep caudal contrast contour which by straining was pushed caudad far beyond the pelvic outlet. On the side view it looked like a balloon with constriction at the cranial end.

Summary and Comment

This young medical student's defecation disorder is characterized by a feeling of rectal block during straining. He thought the symptoms were caused by haemorrhoids. Prostatitis was suspected because of a palpable swelling over the dorsal aspect of the prostate associated with urination distress. Neither diagnosis could be confirmed. The dominating clinical finding is an inward bulge of the ventral rectal wall, particularly during straining when the ampulla becomes wholly filled by a soft mass which projects over the dorsal aspect of the prostate. Roentgen examination shows that the depression is caused by the extremely deep rectogenital pouch which, filled with small bowel, during straining extends caudad like an inflated balloon far beyond the pelvic outlet.

It is probable in view of the patient's youth that the considerable depth of the rectogenital pouch is a constitutional, not unlikely congenital deformity. The characteristic blocking mechanism of the defecation disorder makes it obviously correlated to the palpably and roentgenologically demonstrated anatomic aberration. The augmented rectal and

vesical discomforts immediately after meals might be due to the greater volume and weight of the small intestine because of the contents and to the increased small bowel motility at such times in the apparently narrow-necked peritoneal pocket. The painful abdominal twinges might also be due to the presence of a relatively obstructed intestinal transit at the entry to the pouch. The prostatic abnormality, finally, will find an adequate explanation in the interposition of the probably wrinkled and by fibrous or edematous infiltration swollen peritoneal sac which may also on occasion have contained sections of omentum or other more solid parts of the abdominal contents.

It will be seen that this case is wholly typical and unusually free from admixture of irrelevant symptoms. Therefore the diagnosis is straightforward to one who is aware of the disorder and knows its characteristic features.

Fig. 69. Frontal and side views of the pelvis with contrast in the small bowel in a man of 21 with defecation block. A and C: without straining, showing an unusual depth of the caudal contrast contour. B and D: with straining, showing the contrast displaced far caudad of the pelvic outlet as a balloon whose cranial part narrows in level with the coccygeal tip.

References

Aronsson, H., Nord. med., 1950: *43*: 499.
Austin, R. C., Surg., Gynec. & Obst., 1946: *83*: 725.
Barcley, A. E. & Franklin, K. J., J. Physiol., 1937: *90*: 478.
Bardenheuer: See Sonnenschein.
Barret, Ch. W., West. J. Surg., Obst. & Gynec., 1946: *54*: 279.
Bertrand, F., Le cul-de-sac de Douglas, Thèse de Toulouse, 1927.
Bertrand, Villemur & Baillat: Quoted by Bertrand.
Black, W. T., Am. J. Obst. & Gynec., 1934: *27*: 837.
Broman, I., Anatomie des Bauchfelles (Peritonaeum), Allgemeine Übersicht, Phylo- und Ontogenese, Jena, 1914.
Broman, I. & Ask-Upmark, E., Människokroppens topografiska anatomi, Stockholm, 1941.
Bueerman, W. H., J. A. M. A., 1932: *99*: 1138.
Caldwell, W. E. & Moloy, H. C., Am. J. Obst. & Gynec., 1933: *26*: 479.
Case, J. T., Arch. Roentg. Ray Lond., 1915: *19*: 375.
Chase, H. C., Surg., Gynec. & Obst., 1922: *35*: 717.
Corning, H. K., Lehrbuch der topographischen Anatomie, München, 1923.
Cunéo, B. & Veau, V., J. Anat. et Physiol., 1899: *35*: 235.
Cunningham, J. H., Ann. Surg., 1909: *49*: 681.
Dahlberg, G., Statistical methods for medical and biological students, London, 1940.
Delorme, E., Bull. et mém. Soc. chir. Paris, 1900: *26*: 899.
Denny-Brown, D. & Robertson, E. G., Brain, 1935: *58*: 256.
Denonvilliers, C. P. D., Bull. Soc. anat. Paris, 1836: *11*: 105.
Dickson Wright, A., Proc. Roy. Soc. Med., 1949: *42*: 1005.
Dixon, W. C., Ann. Surg., 1942: *115*: 782.
Dixon, A. F. & Birmingham, A., J. Anat. & Physiol., 1902: *36*: 127.
Duval, P. & Lenormant, C., Rev. chir., 1904: *29*: 728.
Ebner, L., Ztschr. Chir., 1887: *26*: 48.
Edling, N. P. G., Urethrocystography in the male with special regard to micturition, Acta radiol., Suppl. 58, 1945.
Eisenmenger, R., Zschr. Kreislaufforsch., 1935: *27*: 73.
Fredet: Quoted by Schüttoff.
Garry, R. C., J. Physiol., 1933: *78*: 208.
Gaston, E. A., Surg., Gynec. & Obst., 1948: *87*: 280, 669.
Goltz, F. & Ewald, J. R., Arch. ges. Physiol., 1896: *63*: 362.
Graham, R. R., Ann. Surg., 1942: *115*: 1007.
Hayden, E. P., S. Clin. North America, 1947: *27*: 1062.
Hayes, H. T. & Burr, H. B., Am. J. Surg., 1948: *75*: 358.
Hertz (Hurst), A. F., Guy's Hosp. Rep., 1907: *61*: 389.

Holzknecht, G., München. med. Wchnschr., 1909: *56*: 2401.
Hughes, E. S. R., Proc. Roy. Soc. Med., 1949: *42*: 1007.
Hultén, O., Acta chir. scandinav., 1946: *93*: 194.
Hurst: See Hertz.
Hurst, A. F., Constipation and allied intestinal disorders, 2nd ed., London, 1919.
Jeannell: Quoted by Moschcowitz.
Jung, P. & Schirmer, A., Acta radiol., 1926: *5*: 395.
Keibel: Quoted by Traeger.
Keith, A., Brit. M. J., 1923: *1*: 499, 545, 587, 624.
Kelling, G., München. med. Wchnschr., 1902: *49*: 21.
Kjellberg, S. R., Hystero-Salpingo-Pelvigraphie, Acta radiol., Suppl. 43, 1942.
Laurell, H., Acta radiol., 1929: *10*: 462.
Lecours, R., Canad. M. A. J., 1946: *55*: 450.
Lockhart-Mummery, J. P., Brit. M. J., 1939: *1*: 345.
Lloyd-Davies, O. V., Practitioner, 1936: *136*: 186.
Ludloff, K., Arch. klin. Chir., 1899: *59*: 447.
Lynch, F. W., S. Clin. North America, 1922: *2*: 553.
Maes, U. & Rives, J., Surg., Gynec. & Obst., 1926: *42*: 594.
Masson, J. C., J. A. M. A., 1932: *99*: 1143.
Masson, J. C. & Simon, H. E., Surg., Gynec. & Obst., 1928: *47*: 36.
Mayo, Ch. W., West. J. Surg., Obst. & Gynec., 1938: *46*: 75.
Meade, H. S., Irish J. M. Sc., 1942: *6*: 531.
Meigs, J. V., S. Clin. North America, 1947: *27*: 1226.
Mignon, M. A., Bull. et mém. Soc. chir. Paris, 1905: *31*: 824.
Mikulicz, J., Arch. klin. Chir., 1889: *38*: 74.
Miles, L. M., Surg., Gynec. & Obst., 1926: *42*: 482.
Miles, W. E., Rectal surgery, 2nd ed., London, 1944.
Milligan, E. T. C. & Morgan, C. N., Lancet, 1934: *112*: 1150, 1213.
Molinengo, L. & Conte, E., Boll. Soc. piemontese obst., 1933: *1*: 181.
Moschcowitz, A. V., Surg., Gynec. & Obst., 1912: *15*: 7.
—— Surg., Gynec. & Obst., 1918: *26*: 514.
Orr, Th. G., Ann. Surg., 1947: *126*: 833.
Paramore, R. H., Lancet, 1910: *88*: 1393, 1459.
—— Lancet, 1911: *89*: 1677.
Petrunti: Quoted by Watson.
Polk, W. M., Am. J. Obst., 1909: *60*: 418.
Quénu, E. & Duval, P., Rev. chir., 1910: *41*: 135.
Rankin, F. W., Bargen, J. A. & Buie, L. A., The colon, rectum and anus, Philadelphia, 1932.
Rankin, F. W. & Priestley, J. T., Ann. Surg., 1933: *98*: 1030.
Roberts, J. B., Ann. Surg., 1890: *11*: 255.
Rubin, I. C., J. A. M. A., 1920: *75*: 661.
Schüttoff, M., Arch. Anat. u. Physiol., Anat. Abteil., 1903: 122.
Sgalitzer, M. & Hryntschak, Th., Ztschr. Urol., 1921: *15*: 399.
Sick, P., Zentralbl. Chir., 1909: *36*: 1225.
Simon, H. E., J. A. M. A., 1932: *99*: 1146.
Snellman, B., Nord. med., 1951: *46*: 1468.
Sonnenschein, K., Zentralbl. Chir., 1902: *29*: 1129.
Spiesman, M. G., Essentials of clinical proctology, New York, 1946.

Stein, I. F. & Arens, R. A., Radiology, 1930: *15:* 85.
Sweetser, H. B., Ann. Surg., 1919: *69:* 603.
Thompson, P., The myology of the pelvic floor, Newton, 1899.
Thoms, H. & Greulich, W. W., Am. J. Obst. & Gynec., 1940: *39:* 56.
Tobin, Ch. E. & Benjamin, J. A., Surg., Gynec. & Obst., 1945: *80*: 373.
Traeger, F. P., Arch. Anat. u. Physiol., Anat. Abteil., 1897: 316.
Tuttle, J. P., Diseases of the rectum, anus and pelvic colon, New York, 1903.
Uhlenhuth, E., Wolfe, W. M., Smith, E. M. & Middleton, E. B., Surg., Gynec. & Obst. 1948: *86*: 148.
Waldeyer, W., Das Becken, Bonn, 1899.
Walldén, L., Acta radiol., 1944: *25*: 856.
—— Upsala läkaref. förh., 1948: *53*: 267
Watson, L. F., Hernia, 3rd ed., St. Louis, 1948.
Weed, J. C. & Tyrone, C., Am. J. Obst. & Gynec., 1950: *60*: 324.
Wilensky, A. O., & Kaufman, P. A., Am. J. Surg., 1940: *49*: 31.
Ziegenspeck: Quoted by Zuckerkandl.
Zuckerkandl, O., Deutsche Ztschr. Chir., 1891: *31*: 590.

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